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Draft Environmental Impact Statement

Land and Resource Management Plan



Shasta • Trinity National Forests 1993

ADDENDUM

The following document summarizes corrections in the Draft Environmental Impact Statements (DEISs) and proposed Land and Resource Management Plans for the four National Forests in the Klamath province of California.

In July 1993, President Clinton's forest plan for the management of habitat for old growth forest related species within the range of the northern spotted owl was released. Page 2-12 of the Draft Supplemental Environmental Impact Statement that accompanies the President's plan states that "For the four National Forests in northern California, all the alternatives are based on the preferred alternatives as of May 1993 for the Forest Plans that were being prepared. However, these National Forests have since developed updated preferred alternatives which now reflect closely the management direction in Alternative 9." In large part the preferred alternatives as described in the DEISs for the Klamath, Mendocino, Shasta-Trinity, and Six Rivers National Forests are unaffected by the President's proposed forest plan and provide a valid basis for comparison of alternatives. The President's plan is within the range of alternatives considered in the DEISs. This correction identifies changes in the May 1993 preferred alternatives and proposed Plans for each Forest to make them consistent with the President's plan (Alternative 9) and summarizes the consequences of those changes.

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The following document is a part of the record for the Klamath, Mendocino, Six Rivers, and Shasta-Trinity National Forest Plans:

> "Draft Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl" dated July 1993 prepared under the leadership of the Forest Service, U.S. Department of Agriculture and the Bureau of Land Management, U.S. Department of Interior (referred to as the draft SEIS).

The following document is incorporated by reference in the DEISs and proposed Plans for the Klamath, Mendocino, Six Rivers, and Shasta-Trinity National Forests:

> "Forest Ecosystem Management: An Ecological, Economic, and Social Assessment" dated July 1993 prepared by the Forest Ecosystem Management Assessment Team (referred to as the FEMAT report).

Both of these documents were prepared following President Clinton's Forest Conference held in Portland, Oregon on April 2, 1993. Complete copies are available by writing to Robert T. Jacobs, Interagency SEIS Team Leader, P.O. Box 3623, Portland Oregon 97208. Copies are also available for inspection in the Supervisors' Offices of the Klamath, Mendocino, Six Rivers, and Shasta-Trinity National Forests and the Forest Service Regional Office for the Pacific Southwest Region.

The President's plan is described as Option 9 in the FEMAT report (and Alternative 9 in the draft SEIS). Option 9 modified the May 1993 preferred alternatives and proposed Plans described in the attached planning documents for the four National Forests in the Klamath Province in California. This addendum changes the May 1993 preferred alternatives and proposed forest plans to be consistent with the President's plan. Only major changes are described in this document. Readers are cautioned that the entire text has not been revised. Where there is a conflict between the direction in the President's plan and the May 1993 preferred alternatives and proposed Plans, the direction in the President's plan takes precedence. This precedence includes direction associated with mapped locations. Where there is a conflict between the land allocations mapped for the President's plan and any other printed map, the map for the President's plan takes precedence. A map summarizing changes in reserved areas is included with the map packets for the DEISs and proposed Plans for each Forest.

Where there is no conflict or the DEISs and proposed Plans include direction not covered by the President's plan, the relevant sections of the attached DEISs and proposed Plans are unaffected. For example, direction unrelated to management of habitat for late-successional and old-growth forest related species is not affected.

The President's proposed forest plan is currently undergoing public review and comment before being finalized. Changes made in finalizing the President's plan, and comments made on the attached DEISs and proposed Plans for the

Klamath, Mendocino, Six Rivers, and Shasta-Trinity National Forests will be used to finalize Plans for the four National Forests.

In this addendum, May 1993 preferred alternatives refer to preferred alternatives described in the attached planning documents. The President's plan modified the May 1993 preferred alternatives. The President's plan is described as Option 9 in the FEMAT report and Alternative 9 in the draft SEIS.

Changes in May 1993 Preferred Alternatives

Four kinds of changes are made to the May 1993 preferred alternatives described in the attached documents to make them consistent with the President's forest plan:

1. The approximate percentage of the total National Forest area reserved from timber management is increased as follows:

National Forest	May 1993 Preferred Alternative	President's Forest Plan
	- Percent -	
Klamath	65	75
Mendocino	85	90
Six Rivers	75	90
Shasta-Trinity	75	85
Klamath Province Average	75	85

No regulated timber harvest is permitted in the area reserved from timber management.

2. In the area not reserved from timber management (referred to as the matrix in the President's plan), the 50-11-40 rule in the May 1993 preferred alternatives is replaced by a requirement to achieve 180 year rotations with area control.

3. Specific procedural requirements for watershed analysis and oversight are contained in the President's plan and were added to the May 1993 preferred alternatives.

4. Adaptive management areas (AMAs), are designated landscape units designed to encourage the development and testing of technical and social approaches to achieving desired ecological, economic, and other social objectives. There are two designated adaptive management areas in the President's plan. The Goosenest AMA encompasses 169,600 acres on the eastern side of the Klamath Forest; the Hayfork AMA comprises 399,500 acres located on both the Shasta-Trinity and Six Rivers National Forests. AMAs offer additional opportunities for public and interagency involvement. Both Goosenest and Hayfork AMAs have been added to the May 1993 preferred alternatives.

Changes are described in more detail below:

Wildlife

The May 1993 preferred alternatives and the President's plan both provide for late-successional reserves. The late successional reserves in the May 1993 preferred alternatives are based on the Habitat Conservation Areas (HCAs) for the northern spotted owl, while the reserves for the President's plan are based on a combination of Designated Conservation Areas (DCAs) for the northern spotted owl and old growth reserves (LS/OG1 and LS/OG2) from the report of the Scientific Panel on Late-Successional Forest Ecosystems. There are some minor differences in the location of these reserves, but the total acreages are very similar. Late-successional reserve acreage in the May 1993 preferred alternatives ranges from 90 to 100 percent of that in the President's plan.

There is no scheduled timber harvest from the reserves in either the May 1993 preferred alternatives or the President's plan. The cutting of trees in the late-successional reserves for both is guided by the provisions of the Final Draft Recovery Plan for the Northern Spotted Owl. In addition, provisions in the President's plan would allow precommercial and commercial thinnings in stands up to 80 years of age within late successional reserves.

The May 1993 preferred alternatives include interim direction to not sign any decision notices for timber sales that would log existing marbled murrelet habitat until more permanent protection measures for the marbled murrelet are developed and approved. This direction is not included in the President's plan. Under the President's plan, other late-successional reserves include additional LS/OG1 and LS/OG2 in marbled murrelet zone 1, plus all occupied marbled murrelet sites. Both the May 1993 preferred alternatives and President's plan would follow the provisions of the marbled murrelet recovery plan, once it is approved.

Fisheries/Riparian Areas

The riparian standards and guidelines in the May 1993 preferred alternatives were used as a basis for the standards and guidelines in the President's forest plan. The riparian strategy in the May 1993 preferred alternatives is aimed at maintaining nine specific riparian condition goals. In order to meet these goals, two riparian management zones (RMZs) are established. RMZ 1 includes the extent of the inner gorge, landslide areas, the 100 year flood plain, the extent of the riparian vegetation, and the height of two site potential trees, whichever is greatest. RMZ 1 default widths (on both sides of streams) are 300 feet for Class I and II streams. For Class III streams, lakes, ponds, and wetlands greater than one acre, the same criteria except one site potential tree height and a default width of 150 feet are used. RMZ 2 is a zone of consideration for Class IV streams and wetlands less than an acre in size where the emphasis will be on conserving the riparian and aquatic ecosystem. The area will be either one site potential tree height or 100 feet, whichever is greater. Interdisciplinary teams analyze proposed management activities in RMZ 2 on a site-specific basis during project-level planning. RMZ 2 is modeled with minimal timber yields while RMZ 1 is reserved from timber management.

Under the President's plan, interim riparian reserves are designated until the completion of a watershed analysis to identify management opportunities and limitations within each watershed. Riparian reserves are reserved from timber management. The linear distances in feet are minimums. Intermittent streams include some ephemeral streams meeting specified criteria, as well as potentially unstable geologic areas. Reserve widths for intermittent streams are the greater of the average height of a site-potential tree or 100 feet in key watersheds and one-half the height of a site-potential tree or 50 feet elsewhere. Riparian reserves are otherwise equivalent to RMZs in the May 1993 preferred alternatives.

In addition to these riparian reserves and RMZs, both the May 1993 preferred alternatives and the President's plan have key watersheds in which the potential effect on aquatic ecosystems will receive first priority in the consideration of management alternatives. The watersheds identified as key watersheds are nearly identical. Under the May 1993 preferred alternatives, only those activities that are consistent with meeting the overall goals and objectives of the key watershed would be implemented. Under the President's plan, a watershed analysis is specified in key watersheds prior to any management activity. The May 1993 preferred alternatives require an interdisciplinary review of forest roads within key watersheds to establish a desired future condition for the key watershed road network. Under the President's plan there will be no net increase in roads within key watersheds, and no new roads in roadless areas within key watersheds.

Timber/Vegetation

In the matrix (the area of the Forest that is not reserved), the May 1993 preferred alternatives manage the bulk of the acreage at 110 to 180 year rotations. Harvests are designed to retain a range of large green trees or a percentage of the stand area, as well as snags and downed woody material. The 50-11-40 rule applies. Under the President's plan, management in the matrix would consist of 180 year rotations (using area control) for conifer and mixed evergreen forests and 100 years for hardwood forests. The 50-11-40 rule does not apply. Harvests retain 15% of the volume on each cutting unit.

Procedural Changes

The President's plan includes procedures for watershed analysis and oversight committees. These procedural changes do not affect land allocation direction but they do increase opportunities for interagency involvement during plan implementation.

Consequences

Consequences of changes made to the May 1993 preferred alternatives are described below:

As a result of additional unstable and potentially unstable lands being included in riparian reserves and of no new road construction in inventoried roadless areas within key watersheds, the level of total sediment produced from landslides is expected to be slightly lower than that projected for the May 1993 preferred alternatives. With less land being subject to disturbance, the projected Equivalent Road Acres are expected to decrease slightly as well. This will cause a corresponding decrease in the amount of sediment delivered to streams and a slight improvement in water quality and fish habitat quality.

As a result of more land being included in the riparian reserves, the amount of land supporting later seral stages in the future is expected to increase slightly from that projected for the May 1993 preferred alternatives. The amount of land meeting the criteria for "old growth" is also expected to increase slightly. This benefits species which use large blocks of late seral stage habitat and improves connectivity between these blocks in areas where this type of habitat was lacking.

Connectivity between later seral stage habitats would be provided through the matrix by area control and 180-year rotations rather than by the 50-11-40 rule for the northern spotted owl. It is not known which type of connective habitat would be more beneficial to the species using this habitat.

Because reserved area increases by 5-20 percent on individual National Forests, there would be a corresponding reduction in early seral stages over time. This may decrease species populations which use these habitats.

The increase in reserved area would increase the amount of suitable habitat for late-successional and old-growth forest related species. Reserved area is expected to provide adequate suitable habitat to maintain viability of marten and fisher. (The areas managed specifically for sensitive furbearer habitat in the May 1993 preferred alternatives are returned to the matrix in the President's plan.)

Thinning in late successional reserves may lead to achieving desired habitat conditions sooner for late successional species. The provisions for thinning and salvage in late successional reserves are expected to improve forest health in these areas by reducing the risk of future stand-replacing events occurring, such as high intensity wildfires, insect infestations and disease attacks.

The additional lands in reserve status will cause a slight increase in the lands being managed to provide natural landscapes which are defined as those with a visual quality objective of preservation or retention.

The additional lands in reserve status will cause a slight increase in the areas that provide primitive and semi-primitive nonmotorized recreational opportunities.

The additional lands in reserve status will cause a slight increase in the number of acres of inventoried roadless areas that maintain their roadless character.

Due to the additional lands in reserve status, there will be a slight increase in the area with special restrictions on mineral exploration and development.

Land suitable for timber production is reduced by approximately one third province-wide. The remaining timber suitable land base is managed for a 180 year rotation using area control. These two changes interact to reduce allowable timber sale quantities. Reducing the green tree retention standard to a minimum of 15 percent of the volume in cutting units offsets a small portion of this effect. The overall result on a province-wide basis is an approximate 35 percent reduction in the total allowable timber sale quantity (ASQ) for the four National Forests.

Projected ASQs for each Forest are as follows:

Forest	May 1993 Preferred Alternative ASQ Average Annual MMBF	President's Plan Estimated ASQ Average Annual MMBF
Klamath	83	60
Mendocino	23	12
Six Rivers	44	20
Shasta-Trinity	87	60
Province Total	237	152

Estimated ASQs are shown for the President's plan because ASQs were not published for it in the draft SEIS and FEMAT reports. The Six Rivers is affected the most in percentage terms because it has the greatest proportionate reduction in land suitable for timber production (and the greatest proportionate increase in reserved area). Minor increases in the amount of non-scheduled timber volume from thinnings and salvage in reserved areas are possible but have not been projected.

The reduction in timber harvest will cause the socioeconomic effects to be more similar to amenity emphasis alternatives shown in the DEISs. Those whose livelihood is dependent on timber production will be adversely affected. Those not dependent on the timber industry for their livelihood would generally benefit from the increased emphasis on amenity values.

Larger budgets will be required to meet the procedural requirements for watershed analysis, oversight committee reviews, and the adaptive management process. Increased budgetary costs in conjunction with a lower timber harvests will lead to lower present net values, returns to the U.S Treasury, payments to counties, and net cash flows.

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Draft Environmental Impact Statement

Shasta-Trinity National Forests Land and Resource Management Plan

Humboldt, Modoc, Shasta, Siskiyou, Tehama and Trinity Counties, California

Lead Agency:	USDA - Forest Service
Responsible Official:	Ronald E. Stewart, Regional Forester Pacific Southwest Region 630 Sansome Steet San Francisco, California 94111
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Abstract: This Draft Environmental Impact Statement (Draft EIS) documents the results of an analysis of four alternatives which were developed for possible management of the 2.1 million acre Shasta-Trinity National Forests. The alternatives are: (PRF) balanced combination of commodity and amenity production; (RPA) commodity emphasis; (CUR) continuation of present management direction with no change in the level of outputs or activities; and (CBF) developed in conjunction with the Citizens for Better Forestry, a balance between resource use and restoration. Alternative PRF is the preferred alternative, and is the basis for the proposed Land and Resource Management Plan (Forest Plan) which accompanies this document. Upon approval, the Forest Plan will guide management of the Forests for the next 10 to 15 years.

Comments regarding this Draft EIS must be sent to the Forest Supervisor by ..... at the above address.

Reviewers should provide the Forest Service with their comments during the review period of the Draft EIS. This will enable the Forest Service to analyze and respond to the comments at one time and to use information thus acquired in the preparation of the Final Environmental Impact Statement (Final EIS), thus avoiding undue delay in the decision making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act (NEPA) process so that it is meaningful and alerts the agency to the reviewers' position and contentions, Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978), and environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the Final EIS. Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the Draft EIS should be specific and should address the adequacy of the statement or the merits of the alternatives discussed (40 CFR 1503.3).

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SUMMARY for the Draft EIS

Summary for the Draft Environmental Impact Statement (Draft EIS) Shasta-Trinity National Forests

Summary Contents. This summary condenses the most important chapters in the Draft EIS (Chapters I through IV). Refer to the individual chapters in that document for an indepth discussion of the public issues that emerged and the four alternatives that were developed.

Chapter I - Purpose and Need

Chapter Contents. This chapter briefly describes the National Forest Land Management Planning process and addresses the public issues which were identified during the public participation process.

Summary Description of Chapter I. National Forest planning is required by the Multiple-use Sustained Yield Act of 1960 and the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA). National, Regional, and Forest Planning is an integrated three-tiered process. When completed, the Shasta-Trinity National Forests Land and Resource Management Plan (proposed Forest Plan) will provide overall direction for management of National Forest lands and resources.

The Draft EIS examines four alternatives in detail. These alternatives were formulated to aid in the development of a comprehensive land and resource management program for the Shasta-Trinity National Forests. The Draft EIS assesses the environmental consequences of the proposed action (the Preferred Alternative [PRF]), as well as the other three alternatives, as required by the National Environmental Policy Act of 1969 (NEPA). The Preferred Alternative is the basis for the proposed Forest Plan. This document was prepared in conjunction with the Draft EIS to meet NEPA requirements.

The goal of Forest planning is to develop a Forest Plan that provides for the multiple use and sustained yield of goods and services in a way that maximizes long term net public benefits in an environmentally sound manner.

The basic question behind the Forest planning process is "What should be the management direction for the next 10 years?" The first step in addressing this question was to identify public issues specific to the Shasta-Trinity National Forests.

A Draft EIS and proposed Forest Plan were made available to the public on August 16, 1986. Although these documents were withdrawn by the Regional Forester a month later, the public comment period was completed and more than 1,300 responses were received. These responses were then sorted and substantive comments were categorized. Subsequently, these comments were used to determine the issues to be addressed in this document. A subsequent draft was issued in 1990. Based on the response to that draft, the issues were further refined.

Twenty-one public issues emerged as a result of the above process, all of which are addressed in the Draft EIS. However, eight of these issues are especially important; they are discussed throughout this summary. These eight issues are:

How much of the older vegetative seral stages existing on the Forests should be retained? *(Issue #3)*

How should watersheds be managed to maintain or enhance water quality and fisheries? *(Issue #6)*

What activities and outputs should be provided to maintain community stability? *(Issue #7)*

What should the timber harvest level or allowable sale quantity be? *(Issue #16)*

What harvest methods, including clearcutting, should be used to meet management objectives? *(Issue #18)*

How and where should visual quality be protected and enhanced? *(Issue #19)*

What river segments should be recommended for inclusion in the Federal Wild and Scenic Rivers System? *(Issue #20)*

How should the Forests' roadless areas be managed, including the Mt. Eddy Further Planning Area? *(Issue # 21)*

In addition to the above, another important issue emerged: **Should herbicides be used to control vegetation in order to meet timber management objectives?** *(Issue # 15)*. However, this issue is being addressed at the Pacific Southwest Region level. This issue was resolved through a Regional Environmental Impact Statement (EIS) on Vegetation Management for Reforestation and will not be discussed further in this summary. The

proposed Forest Plan will tier to the Vegetation Management EIS.

Chapter II - Alternatives Including the Preferred Alternative

Chapter Contents. In this chapter each alternative is examined in detail. Four alternatives were developed for analysis and discussion.

Summary Description of Chapter II

Alternative PRF (Preferred Alternative). This alternative proposes a combination of commodity and amenity outputs, goods, and services in response to balancing national goals with local issues.

Old-growth. Protection and maintenance of habitat for a variety of wildlife species dependent on early and late seral stages are important considerations. Older overmature habitat would increase by the 5th decade (year 2040).

Water Quality. A primary objective would be to maintain the quality of water at or above State objectives. This would be accomplished through implementation of supplemental management objectives for appropriate management areas (refer to Chapter 4 of the proposed Forest Plan) and through the use of Best Management Practices (BMPs). See the Riparian Areas section for a discussion of riparian management zones (RMZs). No scheduled timber harvest would be allowed within an average width of 600 feet (300 feet on each side) along Class 1 and 2 streams or within an average width of 300 feet (150 feet on each side) along Class 3 streams. Only modified harvest would be allowed within an average width of 200 feet (100 feet on each side) along Class 4 streams. The condition of many of the watersheds would improve by the 5th decade.

Community Stability. Community stability for those dependent on wood products would not be maintained. County receipts produced by this alternative would average less than historic levels, and employment would decrease.

Timber Harvest Levels. Timber management activities would be conducted to achieve a wide variety of resource objectives. Timber sell volumes would be 35 percent of the average of the last decade. The suitable land base would decline significantly from historic levels and the number of acres available for timber management would decline appreciably.

Clearcutting. The practice of removing all vegetation from a harvested site by clearcutting would decrease significantly from historic levels. Approximately five percent of the total acres harvested could be by this practice, and only when it was the method that best met the overall resource management objectives.

Visual Quality. Visual quality would be emphasized along candidate State scenic highways in the Whiskeytown-Shasta-Trinity National Recreation Area, on Mt. Shasta, around most developed recreation sites, and in some key dispersed recreation areas. Visual quality would also be emphasized in the foreground of sensitive travel corridors, wild and scenic rivers, and special emphasis areas. Wildernesses would be managed to preserve the characteristic landscape. In the remainder of the Forests, management activities would not dominate the landscape. Overall, visual quality would increase from the present level.

Wild and Scenic Rivers. Four rivers would be recommended for designation:

Beegum Creek	(Wild segments)
North Fork Trinity River	(Wild segments)
South Fork Trinity River	(Wild, Scenic and Recreation segments)
Virgin Creek	(Wild segments)

Roadless Areas. Vegetation manipulation would be excluded from 81 percent of all roadless area acres.

Alternative RPA (1990 RPA Program Emphasis). This alternative portrays how the 1990 RPA program could best be implemented for the Shasta-Trinity National Forests.

Old-growth. This alternative would place more emphasis on wildlife species dependent upon early seral stages (i.e., deer), but like Alternative PRF would provide for increased levels of late seral stage habitat. Older overmature habitat would increase by the 5th decade.

Water Quality. A primary objective would be to maintain the quality of water at or above State objectives. This would be accomplished through implementation of supplemental management objectives for appropriate management areas (refer to Chapter 4 of the proposed Forest Plan) and through the use of Best Management Practices (BMPs). See the Riparian Areas section for a discussion of riparian management zones (RMZs). No scheduled timber harvest would be allowed within an average width of 600 feet (300 feet on each side) along Class 1 and 2 streams or within an average width of 300 feet (150 feet on each side) along Class 3 streams. Only modified harvest would be allowed within an average width of 200 feet (100 feet on each side) along Class 4 streams. The condition of many of the watersheds would improve by the 5th decade.

Community Stability. Community stability for those dependent on the wood products industry would not be maintained, but would be greater than Alternative PRF. County receipts and employment produced by this alternative would be less than historic levels, but would be greater than PRF.

Timber Harvest Levels. Timber harvest levels would come as close as possible to the 1990 RPA timber targets as constrained by the listing of the northern spotted owl. The suitable land base would decline from historic levels but would be higher than Alternative PRF.

Clearcutting. The practice of removing all vegetation from a harvested site by clearcutting would decrease significantly from historic levels. Less than half of the total acres harvested would be by this practice.

Visual Quality. Visual quality would be emphasized along candidate State scenic highways in the Whiskeytown-Shasta-Trinity National Recreation Area, on Mt. Shasta around most developed recreation sites, and in the foreground of sensitive travel corridors. Existing wild and scenic rivers and special interest areas would continue to be managed in the foreground to protect scenic quality. Wildernesses would be managed to preserve the characteristic landscape. In the remainder of the Forests, management activities would not dominate but might be noticeable on the landscape. Overall, visual quality would increase slightly from the present level.

Wild and Scenic Rivers. No additional rivers would be recommended for designation.

Roadless Areas. Vegetation manipulation would be excluded from 71 percent of all roadless area acres.

Alternative CUR (No Action/No Change). Under this alternative the current level and mix of outputs, based on land allocations, directions, policies and practices, would continue. Goods and services would be provided at 1989 levels to the extent possible given recent threatened and endangered species listings.

Old-growth. Wildlife species dependent upon early to mid-seral stages would be emphasized to less of a degree than Alternative PRF but greater than Alternative RPA. Older over-mature habitat would increase by the 5th decade.

Water Quality. A primary objective would be to maintain the quality of water at or above State objectives. This would be accomplished through implementation of supplemental management objectives for appropriate management areas (refer to Chapter 4 of the proposed Forest Plan) and through the use of Best Management Practices (BMPs). See the Riparian Areas section for a discussion of riparian management zones (RMZs). No scheduled timber harvest would be allowed within an average width of 600 feet (300 feet on each side) along Class 1 and 2 streams or an average of 300 feet (150 feet on each side) along Class 3 streams. Only modified harvest would be allowed within an average width of 200 feet (100 feet on each side) along Class 4 streams. The condition of many of the watersheds would improve by the 5th decade.

Community Stability. Community stability for those dependent on the wood products industry would not be maintained. County receipts and employment would decrease from historic levels, but would be greater than Alternative PRF and less than Alternative RPA.

Timber Harvest Levels. Timber management activities would be conducted to achieve the current level of timber outputs, based on management direction from existing Multiple-use Plans and Timber Management Plans although timber outputs would be greatly reduced from historic levels. The suitable land base and the number of acres available for timber management would be significantly reduced from historic levels.

Clearcutting. The practice of removing all vegetation from a harvested site by clearcutting would decrease significantly from historic levels. About one-third of the total acres harvested would be by this practice.

Visual Quality. Visual quality would be emphasized along candidate State scenic highways in the Whiskeytown-Shasta-Trinity National Recreation Area, on Mt. Shasta, in developed recreation sites, and in the foreground of most sensitive travel corridors. Existing wild and scenic rivers and special interest areas would be managed in the foreground to provide special emphasis for scenic quality. Wildernesses would be managed to preserve the characteristic landscape. Forest management activities would dominate the landscape only on a small portion of the land base that emphasises wood fiber production. Overall, visual quality would increase slightly from the present level.

Wild and Scenic Rivers. No additional rivers would be recommended for designation.

Roadless Areas. Vegetation manipulation would be excluded from 70 percent of all roadless area acres.

Alternative CBF (Citizens for Better Forestry). This alternative was developed in conjunction with the "Citizens for Better Forestry", a regional coalition of environmental groups. The goal of this alternative is to strike a balance between resource use and resource restoration.

Old-growth. The importance of maintaining habitat for wildlife species dependent upon late seral stages is

stressed in this alternative. Older over-mature habitat would increase by the 5th decade.

Water Quality. A primary objective would be to maintain the quality of water at or above State objectives. This would be accomplished through implementation of supplemental management objectives for appropriate management areas (refer to Chapter 4 of the proposed Forest Plan) and through the use of Best Management Practices (BMPs). See the Riparian Areas section for a discussion of riparian management zones (RMZs). No scheduled timber harvest would be allowed within an average width of 600 feet (300 feet on each side) along Class 1 and 2 streams or an average width of 300 feet (150 feet on each side) along Class 3 streams. Only modified harvest would be allowed within an average width of 200 feet (100 feet on each side) along Class 4 streams. The condition of many of the watersheds would improve by the 5th decade.

Community Stability. Community stability for those dependent on the wood products industry would decline significantly. County receipts and employment would decrease below all the other alternatives.

Timber Harvest Levels. Timber outputs would be less than 30 percent of historic levels. The suitable land base would decline substantially below current and historic levels. The number of acres available for timber management would be the least of all the alternatives.

Clearcutting. The practice of removing all vegetation from a harvested site by clearcutting would not be used in this alternative. Emphasis would be placed on uneven-aged systems including single tree and group selection.

Visual Quality. Visual quality would be emphasized in the Whiskeytown-Shasta-Trinity National Recreation Area, on Mt. Shasta, in the McCloud River area, within the proposed Trinity Divide Biolink, and around most developed recreation sites. An expanded wild and scenic rivers system would be managed to provide protection for scenic quality. Wildernesses would be managed to preserve the characteristic landscape. Forest management activities would dominate the landscape only on a small portion of the land base that emphasizes wood fiber production. Overall, visual quality would increase slightly from the present level.

Wild and Scenic Rivers. Nine rivers, and a portion of another one, would be recommended for designation:

Beegum Creek	(Wild segments)
Canyon Creek	(Wild and Recreation segments)
Hayfork Creek	(Scenic segments)
Lower McCloud River	(Wild and Scenic segments)
Upper McCloud River	(Recreation segments)
North Fork Trinity River	(Wild segments)
South Fork Trinity River	(Wild, Scenic and Recreation segments)
Sacramento River	(Recreation segments)
Squaw Valley Creek	(Wild and Scenic segments)
Virgin Creek	(Wild segments)

Chapter III - Affected Environment

Chapter Contents. This chapter describes the Forests' resources and the environment which would be affected by implementation of the proposed Forest Plan.

Summary Description of Chapter III. The 2.1 million acre Shasta-Trinity National Forests lie in the heart of Northern California. Approximately 700,000 acres of other land ownerships lie within the Forests' boundary. The Forests are located within Humboldt, Modoc, Shasta, Siskiyou, Trinity, and Tehama counties. Within the Forests' boundaries are a diverse and complex array of soil and vegetation types representing portions of at least four major physiographic provinces: (1) the Cascade Mountains, (2) the Klamath Mountains, (3) the Coast Range, and (4) the Sacramento Valley.

The Shasta-Trinity National Forests are located within four hours driving time of the San Francisco Bay area and Sacramento population centers. The boundaries are a few minutes drive from Redding, a city of almost 70,000 people. Other population centers within the Forests' zone of influence include Burney, McCloud, Mt. Shasta City, Dunsmuir, Weed, Hayfork, and Weaverville.

Because of their geographic location and physiographic variety, the Shasta-Trinity National Forests contain a diverse array of economic, social, and resource situations.

Old-growth. The management of old-growth (older over-mature habitat) coniferous forests is a topic that has received much public debate. The spotted owl is considered to be a species which depends on older over-mature habitat for its survival. Some are concerned that insufficient acreage is being maintained while others argue that the economic value of the timber dictates that less acreage should be maintained. No universally accepted definition has been developed for old-growth by forest type. Most concerns focus on large, old conifer stands that have a high level of decadence. For tracking in the alternatives this situation is described as 4C-older. These older over-mature stands make up about 13

percent (263,000 acres) of the vegetation on the Shasta-Trinity National Forests.

Water Quality. Management objectives within identified riparian areas are directed toward maintaining the riparian ecosystem and protecting streamcourses and water quality. These areas are important to fisheries and wildlife habitat. The publication "Water Quality Management for National Forest System Lands in California" includes several Best Management Practices (BMPs) specific to management of riparian areas.

In order to protect water quality and, subsequently, riparian areas, one BMP requires that riparian management zones (RMZs) be defined in terms of boundaries and appropriate management activities. Timber management activities and RMZ widths vary according to site conditions. For instance, is the stream perennial, intermittent or ephemeral, and is there a potential for surface erosion and mass wasting? Accordingly, harvest prescriptions can vary from the retention of noncommercial vegetation within 150 feet of a channel to full retention of all vegetation within 300 feet of a channel. Presently, Class 1 and 2 streams are managed under a full retention no timber harvest objective within an average total width of 600 feet (300 feet on each side) as are Class 3 streams within an average total width of 300 feet (150 feet on each side). Class 4 streams are managed under modified timber management within an average total width of 200 feet (100 feet on each side).

Watershed condition is a description of the health of a watershed, or portion thereof, in terms of the factors which effect hydrologic function and soil productivity. Watershed condition can be classified by evaluating the cumulative watershed impacts. This method calculates soil disturbance and compaction from road building and timber harvest activities in equivalent road acres (ERAs). A watershed's sensitivity is evaluated and classified and a threshold of concern (TOC) value is assigned. This value is expressed in percent ERA, with lower sensitivity watersheds having a higher TOC than the highly sensitive watersheds. The TOC value is meant to indicate a point where, if approached or exceeded, the risk of watershed degradation is considered significant and mitigation measures should be implemented to lessen the hazard.

Watershed condition classes are defined in terms of level of ERAs for individual watersheds with respect to the individual TOC. Class 1 (good to excellent condition) is defined as ERA levels of less than 40 percent of TOC; Class 2 (fair to good condition) is 40 to 80 percent of TOC; and Class 3 (fair to poor condition) is greater than 80 percent TOC.

Sixty-one watersheds have been identified within the Forests. Most of these are in good condition, but seven watersheds are in poor condition.

Community Stability. Resource management activities on the Forests have considerable economic impact on Shasta, Siskiyou, and Trinity counties. Minor impacts occur in Tehama county. The shared receipts (otherwise known as "25 percent receipts") are almost a direct result of timber harvest levels and the amount of National Forest land in each county. Timber harvest, recreation visitor days, grazing, and total Forest Service expenditures are the driving forces in generating income and employment.

Over the last four years county receipts have averaged about 9 million dollars. Payments to the counties would be lower if based solely on actual receipts and not computed under the 1991, 1992, and 1993 Appropriations Acts. Future 25 percent county receipts will be significantly lower due to major reductions in timber harvests. Total employment generated by the Shasta-Trinity National Forests historically is estimated at 6,517 jobs within the four counties. Current outputs will generate an estimated 2,567 jobs.

Timber Harvest Levels. The annual programmed harvest level under the 1975 Timber Management Plan was about 242 million board feet (MMBF) after adjustments were made for the California Wilderness Act. This harvest level was based on a suitable timber land base of about 1,074,000 acres.

The actual volume sold between 1975 and 1992 averaged about 200 MMBF per year. The actual sell volume was less than the programmed harvest level due primarily to budget limitations, poor timber markets during the early 1980s, and certain restrictions on the timber land base (such as herbicides and roadless areas).

Of the 2.1 million acres of National Forest land on the Forests, about 76 percent, or 1,629,000 acres, is forested with commercial conifers. Of that amount about 1,077,775 acres are classified as tentatively suitable and available for timber production. About half of this amount, 502,800 acres, is being managed for modified and occasionally intensive timber; 133,000 acres are managed for minimal timber, and 442,000 acres are unsuitable for timber production.

Clearcutting. The 1975 Timber Management Plan and Environmental Impact Statement selected even-aged management as the preferred method for the Plan period (1975 to present). Clearcutting has been the primary method used to regenerate stands under this Plan. During the period from 1984 through 1990, about 49 percent of the acres harvested were clearcut.

Visual Quality. Lands within the Forests have been divided into three variety classes. These variety classes are a measure of the scenic attributes of the landscape, such as landform, water, and vegetative pattern. The three variety classes are: Distinctive (Variety Class A),

Common (Variety Class B), and Minimal (Variety Class C). Over time, landscapes within the above variety classes undergo various amounts of physical alteration due to activities like road building, timber harvesting, campground construction, mining, etc. The existing visual condition is a measure and classification of the degree of physical alternation. The six visual condition classes vary from Class I areas that are unaltered to Class VI areas which are physically altered on a large scale.

Class I (Untouched) is equivalent to a visual quality objective (VQO) of preservation; Class II (Unnoticed) - VQO of retention; Class III (Minor Disturbances) - VQO of partial retention; Class IV (Disturbed) - VQO of modification; Class V (Major Disturbance) - VQO of maximum modification; and Class VI (Drastic Disturbance) - VQO of unacceptable modification.

Presently, 43 percent of the Forests' total land base is considered Untouched, 47 percent Unnoticed, 6 percent Minor Disturbances, 3 percent Disturbed and one percent Major Disturbances.

Wild and Scenic Rivers. Approximately 106.4 miles of the Trinity River system are designated as part of the Federal Wild and Scenic Rivers system on the Shasta-Trinity National Forests.

Ten additional rivers and streams have been identified as having the potential for Wild and Scenic River designation. These include Beegum Creek (17.0 miles), Canyon Creek (21.5 miles), Hayfork Creek (11.5 miles), Upper McCloud River (14.7 miles), Lower McCloud River (6.1 miles), Upper North Fork Trinity River (11.7 miles), upper section of the South Fork Trinity River (24.8 miles), Sacramento River (6.1 miles), Squaw Valley Creek (10.0 miles), and Virgin Creek (11.7 miles).

Designation would maintain the outstandingly remarkable values of these rivers. Other management activities, such as timber harvesting, including those on intermingled private lands, could be restricted.

Roadless Areas. There are five Wildernesses, totaling 498,776 acres, on the Shasta-Trinity National Forests. These are Castle Crags (10,483 acres), Chanchelulla (7,800 acres), Mt. Shasta (38,560 acres), Trinity Alps (405,128), and Yolla Bolly-Middle Eel (36,804 acres).

There is one further planning area, Mt. Eddy, which totals 7,720 acres. Areas in the further planning category are to be considered for both wilderness and non-wilderness options during the Forest planning process.

The 1984 California Wilderness Act released 29 roadless areas to be managed for multiple-uses other than wilderness. These areas total 306,060 acres.

Chapter IV - Environmental Consequences

Chapter Contents. This chapter discloses the potential consequences or impacts of each of the alternatives described in Chapter II. The intent is to provide an analytical and scientific basis on which to compare the alternatives.

Summary Description of Chapter IV. Under each alternative a different combination of theme and resource program direction produces different resource outputs and uses. Although the consequences of each alternative fall within certain limits due to the inclusion of a common set of management requirements and practices, each alternative would result in distinct environmental consequences. The environmental consequences, as well as the relative ranking of each alternative to eight major issues, follows:

Alternative PRF (Preferred Alternative)

Old-growth. By the 5th decade over 350,000 acres of older over-mature habitat would exist. This alternative ranks **equal** with Alternatives CUR and RPA and slightly less than Alternative CBF in maintaining and providing acres of older over-mature habitat.

Water Quality. By the 5th decade 42 watersheds would be in good to excellent condition, 19 in fair to good condition, and 0 in fair to poor condition. This alternative ranks **second** in maintaining and enhancing watershed condition.

Community Stability. In the 1st decade (ten years from present) receipts to the counties would be an estimated 5 million dollars a year and 3,633 jobs would be maintained or created. This alternative ranks **third** in producing county receipts and in employment.

Timber Harvest Levels. Average annual timber sale volume would be 87 million board feet (MMBF) from a suitable land base of 575,300 acres. On this suitable land base modified and occasionally intensive timber management would be applied on 473,000 acres and minimal timber harvest on 102,300 acres. This alternative ranks **third** in timber volume offered for sale and the number of acres available for timber management. Approximately 502,500 suitable acres would not be available for timber management due to land allocations to other uses.

Clearcutting. This practice could occur on 300 acres per year and compose 5 percent of the total acres harvested. This alternative ranks **third** in percent of acres clearcut.

Visual Quality. Management activities that result in an Untouched (preservation) condition, are Unnoticed (retention) or create a Minor Disturbance (partial

retention) would occur on 62 percent of the Forests' land base. Twenty-three percent of the land base would be Untouched, 22 percent would be Unnoticed, and 17 percent would have Minor Disturbances. This alternative ranks **second** in the percent of the land base where management activities result in an Untouched condition, are Unnoticed, or create a Minor Disturbance.

Wild and Scenic Rivers. A total of 62.2 miles would be recommended for designation as follows:

Wild segments	42.0 miles
Scenic segments	17.3 miles
Recreation segments	2.9 miles

This alternative ranks **second** in the number of miles of river recommended for designation.

Roadless Areas. A total of 247,909 acres of the 29 released roadless areas would remain undeveloped. This alternative ranks **second** in the number of acres of released roadless areas that remain undeveloped.

Alternative RPA (1990 RPA Program Emphasis)

Old-growth. By the 5th decade over 350,000 acres of older over-mature habitat would exist. This alternative ranks even with Alternatives PRF and CUR and slightly less than Alternative CBF in maintaining and providing acres of older over-mature habitat.

Water Quality. By the 5th decade 31 watersheds would be in good to excellent condition, 29 in fair to good condition, and one in fair to poor condition. This alternative ranks **last** in maintaining and enhancing watershed condition.

Community Stability. In the 1st decade (ten years from present) receipts to counties would be 8 million dollars a year and 3,888 jobs would be maintained or created. This alternative ranks **first** in producing county receipts and employment.

Timber Harvest Levels. Average annual timber sale volume would be 112.4 MMBF feet from a suitable land base of 638,100 acres. On this suitable land base intensive and modified timber management would be applied on 537,700 acres and minimal timber harvest on 100,400 acres. This alternative ranks **first** in timber volume offered for sale and the number of acres available for any timber management. Approximately 439,700 suitable acres would not be available for timber management due to land allocations to other uses.

Clearcutting. This practice would occur on 3,810 acres per year and compose 62 percent of the total acres harvested. This alternative ranks **first** in percent of acres clearcut.

Visual Quality. Management activities that result in an Untouched (preservation) condition, are Unnoticed (retention) or create a Minor Disturbance (partial retention) would occur on 52 percent of the Forests' land base. Twenty-four percent of this land base would be Untouched, 19 percent would be Unnoticed, and 9 percent would have Minor Disturbances. This alternative ranks **last** in the percent of the land base where management activities result in Untouched, Unnoticed or Minor Disturbance to visual conditions.

Wild and Scenic Rivers. No additional miles would be recommended for designation.

Roadless Areas. A total of 217,303 acres of the 29 released roadless areas would remain undeveloped. This alternative ranks **third** in the number of acres of released roadless areas that remain undeveloped.

Alternative CUR (No Action/No Change)

Old-growth. By the 5th decade 350,000 acres of older over-mature habitat would exist. This alternative ranks **equal** with Alternatives PRF and RPA and slightly less than Alternative CBF in maintaining and providing acres of older over-mature habitat.

Water Quality. By the 5th decade 41 watersheds would be in good condition, 20 in fair condition, and 0 in poor condition. This alternative ranks **third** in maintaining and enhancing watershed condition.

Community Stability. In the 1st decade (ten years from present) receipts to the counties would be 7 million dollars a year and 3,682 jobs would be maintained or created. This alternative ranks **second** in producing county receipts and employment.

Timber Harvest Levels. Average annual timber sale volume would be 105.8 MMBF from a suitable land base of 635,800 acres. On this suitable land base intensive and modified timber management would be applied on 502,800 acres and minimal timber harvest on 133,000 acres. This alternative ranks **second** in timber volume offered for sale and the number of acres available for timber management. Approximately 442,000 suitable acres would not be available for timber management due to land allocations to other uses.

Clearcutting. This practice would occur on 3,160 acres per year and compose 40 percent of the total acres harvested. This alternative ranks **second** in percent of acres clearcut.

Visual Quality. Management activities that result in an Untouched (preservation) condition, are Unnoticed (retention) or create a Minor Disturbance (partial retention) would occur on 58 percent of the Forests' land base.

Twenty-four percent of this land base would be Untouched, 19 percent would be Unnoticed and 15 percent would have Minor Disturbances. This alternative ranks **third** in the percent of the land base where management activities result in an Untouched condition, are Unnoticed, or create only a Minor Disturbance.

Wild and Scenic Rivers. No additional miles would be recommended for designation.

Roadless Areas. A total of 220,363 acres of the 29 released roadless areas would remain undeveloped. This alternative ranks **last** in the number of acres of released roadless areas that remain undeveloped.

Alternative CBF (Citizens for Better Forestry)

Old-growth. By the 5th decade 370,000 acres of older over-mature habitat would exist, slightly higher than Alternatives PRF, RPA and CUR in maintaining and providing acres of older over-mature habitat.

Water Quality. By the 5th decade 50 watersheds would be in good condition, 11 in fair condition, and 0 in poor condition. This alternative ranks **first** in maintaining and enhancing watershed condition.

Community Stability. In the 1st decade (ten years from present) receipts to the counties would be 4 million dollars a year and 3,208 jobs would be maintained or created. This alternative ranks **last** in producing county receipts and employment.

Timber Harvest Levels. Average annual timber sale volume would be 65.3 MMBF from a suitable land base of 495,400 acres. On this suitable land base modified and occasionally intensive timber management would be applied on 372,700 acres and minimal timber harvest on 122,700 acres. This alternative ranks **last** in timber volume offered for sale and **last** in the suitable land base available for timber management. Approximately 582,400 suitable acres would not be available for timber management due to land allocations to other uses.

Clearcutting No clearcutting would occur under this alternative. This alternative ranks **last** in percent of acres clearcut.

Visual Quality. Management activities that result in an Untouched (preservation) condition, are Unnoticed (retention) or create a Minor Disturbance (partial retention) would occur on 76 percent of the Forests' land base. Twenty-three percent of this land base would be Untouched, 23 percent would be Unnoticed, and 30 percent would have Minor Disturbances. This alternative ranks **first** in the percent of the land base where management activities result in Untouched condition, are Unnoticed or create a Minor Disturbance.

Wild and Scenic Rivers. A total of 116.6 miles would be recommended for designation as follows:

Wild segments	56.8 miles
Scenic segments	25.1 miles
Recreation segments	34.7 miles

This alternative ranks **first** in the number of miles of river recommended for designation.

Roadless Areas. A total of 269,333 acres of the 29 released roadless areas would remain undeveloped. This alternative ranks **first** in the number of acres of released roadless areas that remain undeveloped.

Comparison of Alternatives

Figures S-1 through **S-10** display how the alternatives and the comparison of the 1989 base year relate to the eight major public issues.

Figure S-1
Old-growth
(Older Over-mature Habitat)
(5th Decade - Year 2040)

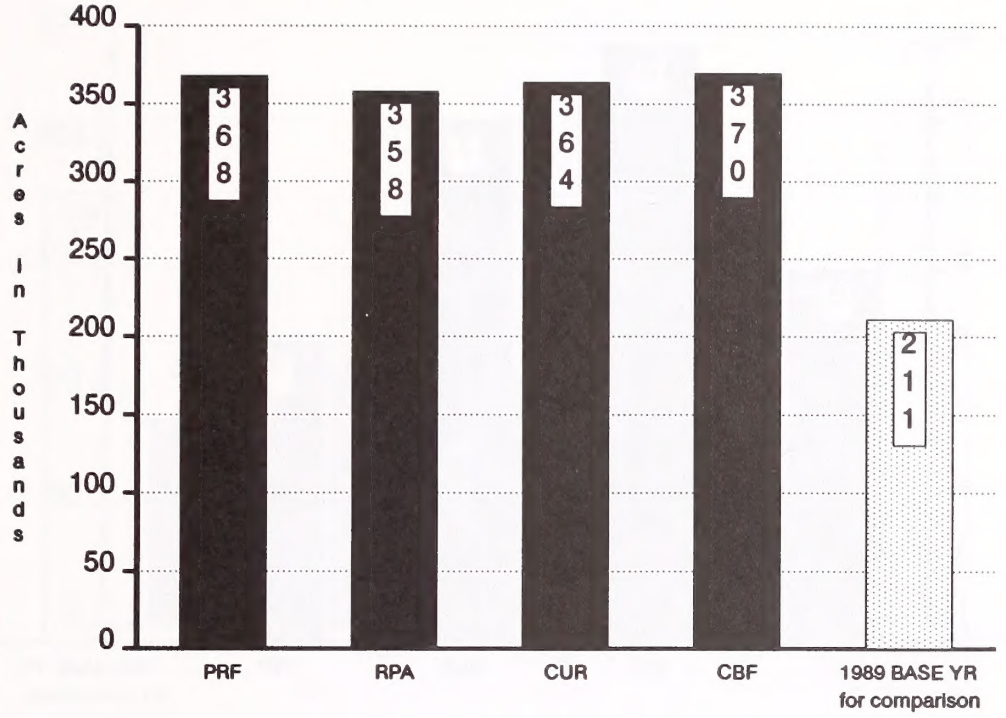


Figure S-2
Water Quality
(Watershed Condition Classes)
(5th Decade - Year 2040)

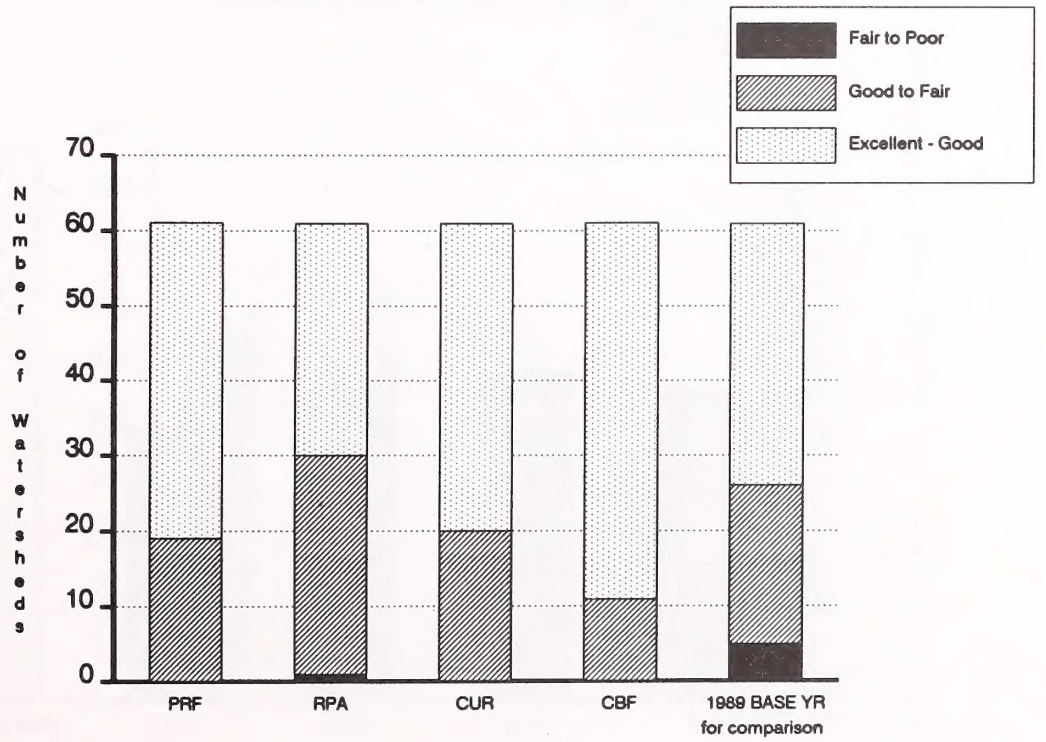


Figure S-3
Community Stability
(County Receipts)
(Average Annual for 1st Decade)

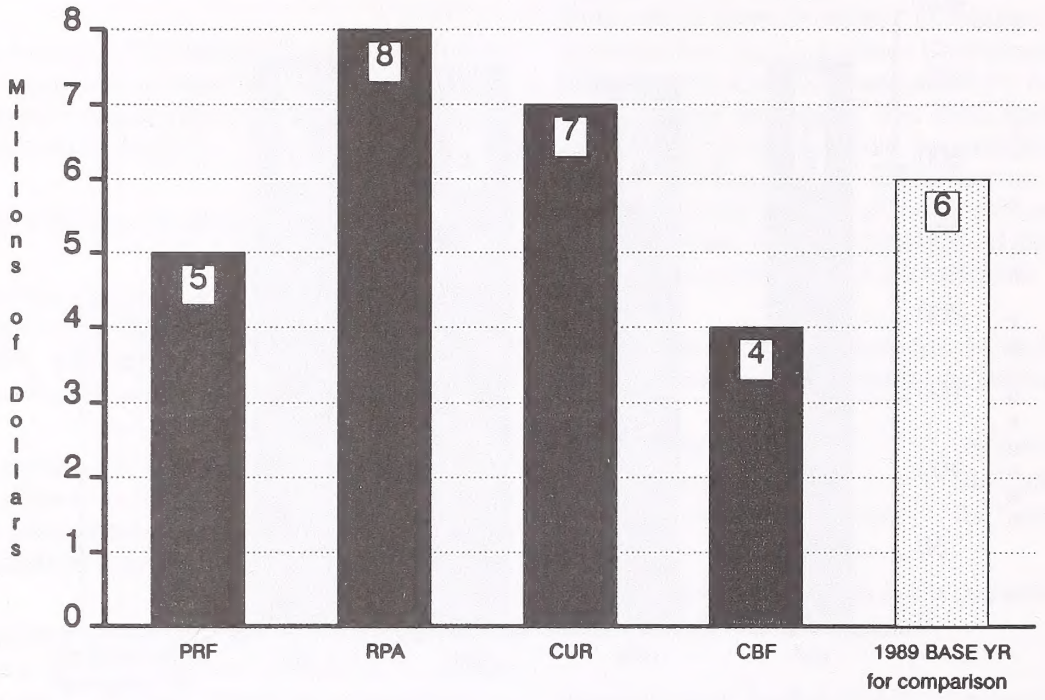


Figure S-4
Community Stability
(Employment)
(Average Annual for 1st Decade)

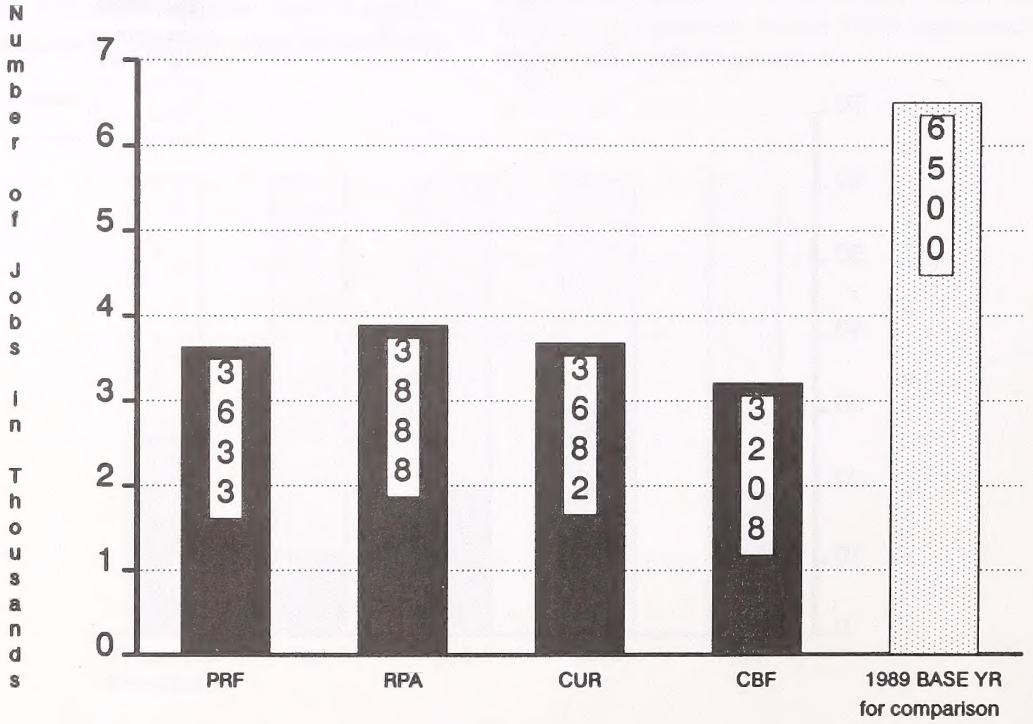


Figure S-5
Timber Harvest Level
(Average Annual for 1st Decade)

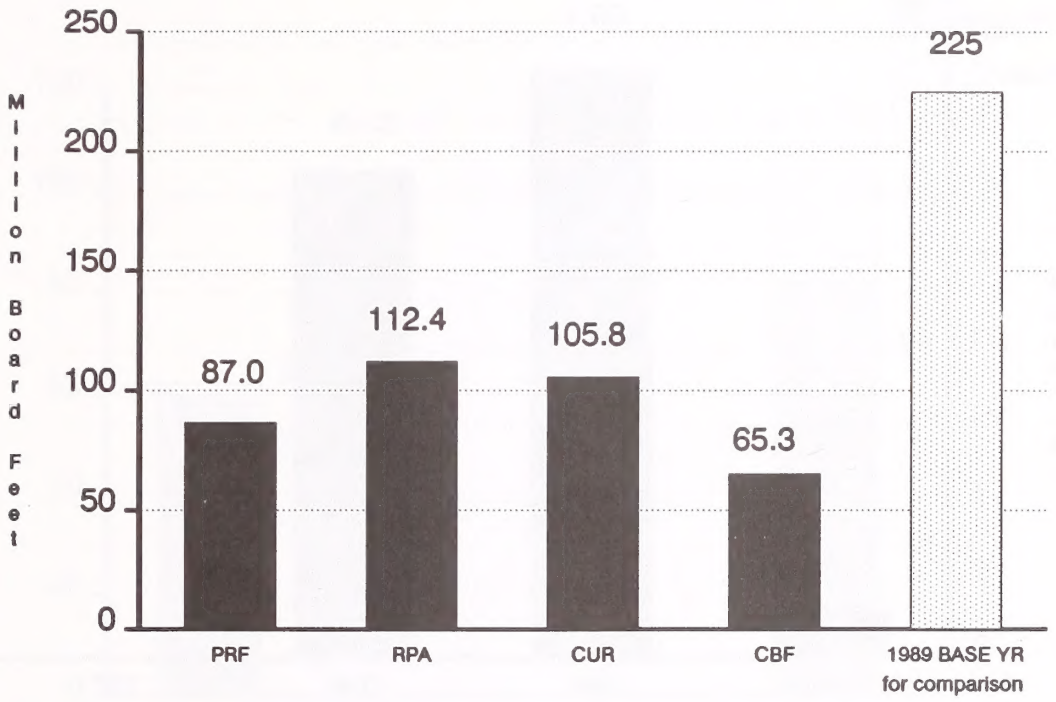


Figure S-6
Timber Harvest Level
(Suitable Land Base by Timber Intensity)

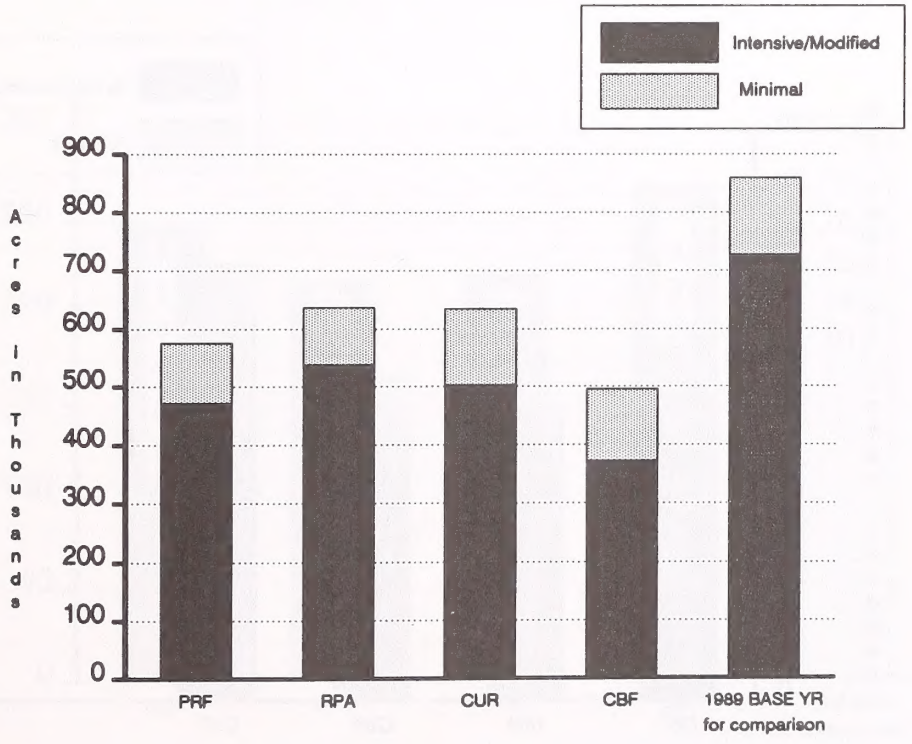


Figure S-7
Clearcutting (Acres Harvested)
(1st Decade - Ten Years from Present)

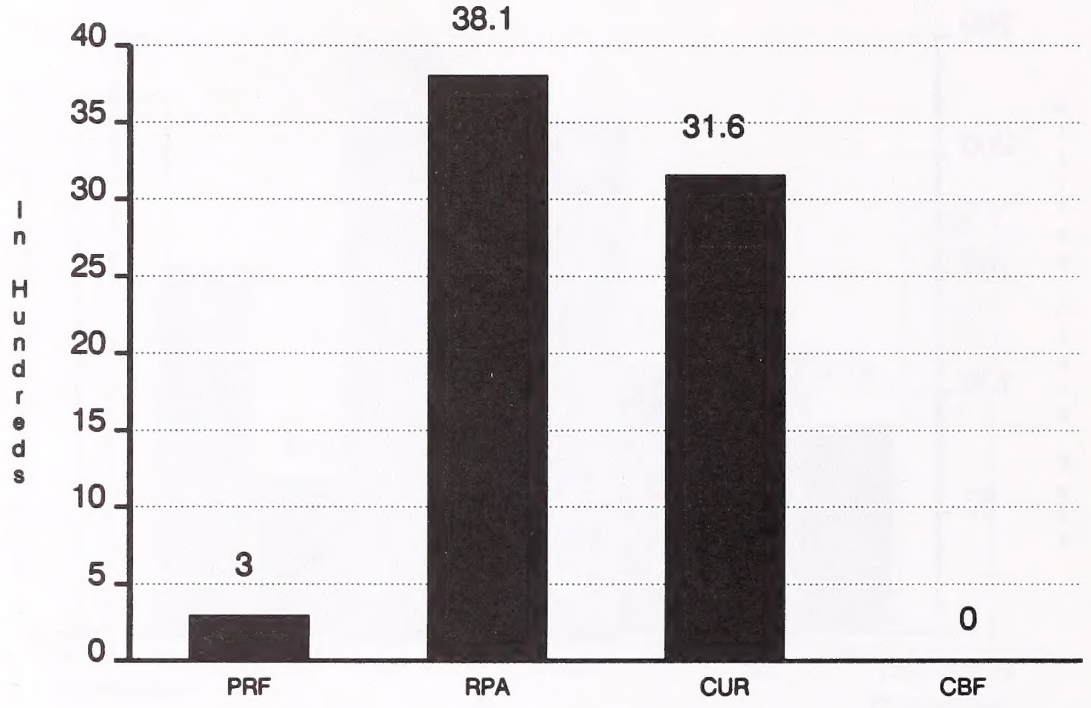


Figure S-8
Visual Quality
(Untouched/Unnoticed and Minor Disturbance)

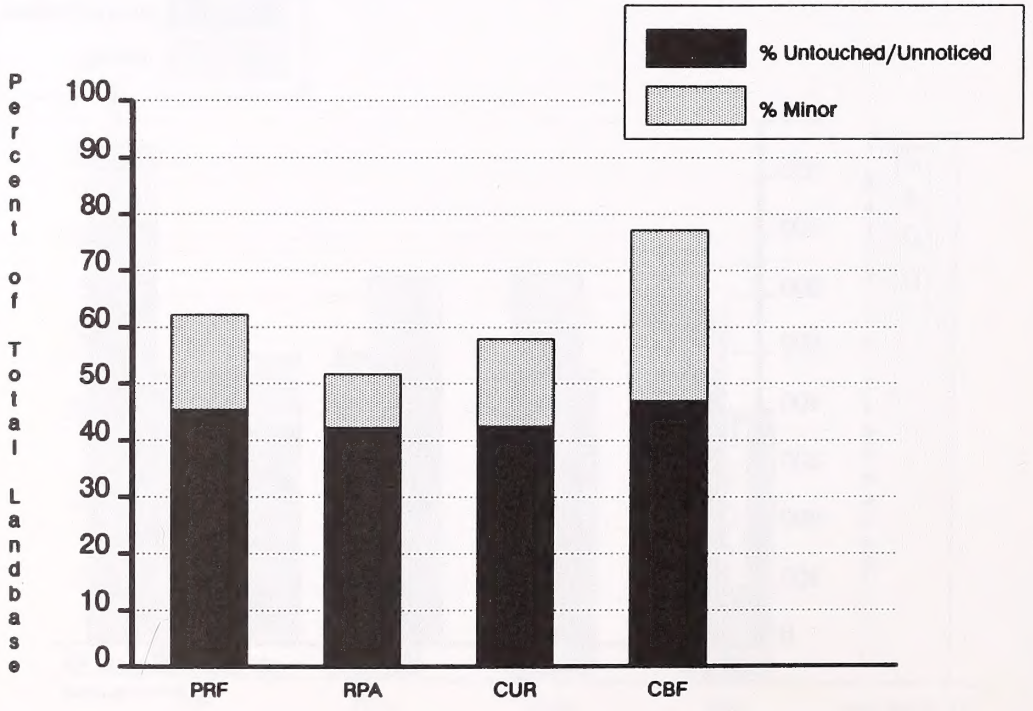


Figure S-9
Wild and Scenic Rivers
(Rivers Recommended for Designation)

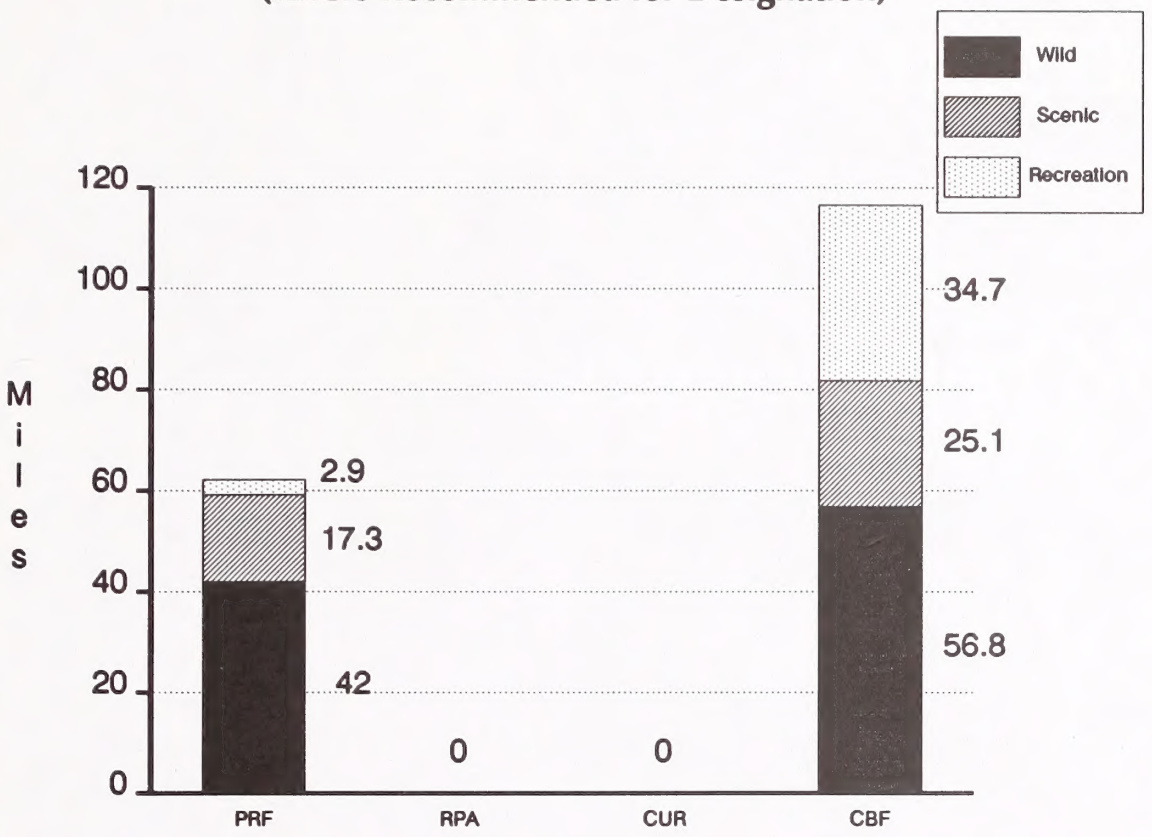
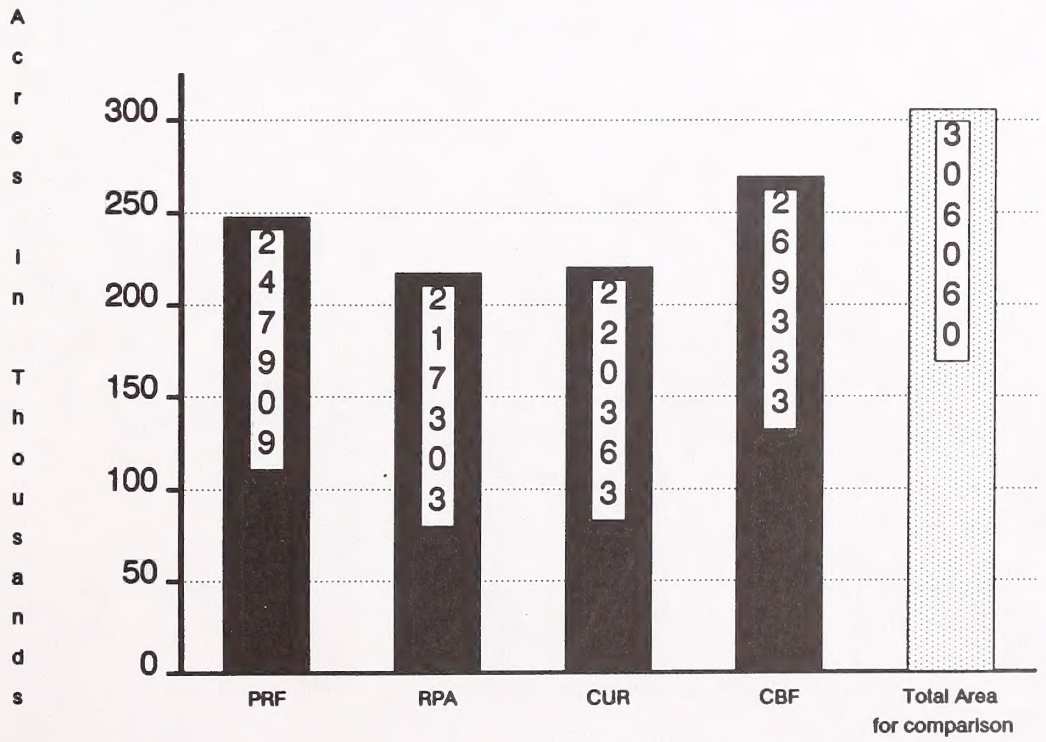


Figure S-10
Roadless Areas
(Released Roadless Areas to Remain Undeveloped)





CHAPTER I

Purpose and Need

Chapter Contents

CHAPTER I - Purpose and Need

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CHAPTER I
Purpose and Need

Introduction and Background

A

This chapter introduces the proposed development of a Land and Resource Management Plan for the Shasta-Trinity National Forests. Specifically, Chapter I identifies the public issues which have guided the long-range planning process. In addition, this chapter discusses the legislative framework that has been enacted for long range planning; it identifies which plans will be replaced by and/or incorporated into the proposed Forest Plan; it outlines the planning process including the inter-relationship of National, Regional, and Forest planning; and it identifies the geographic area covered.

A Draft Environmental Impact Statement (Draft EIS) and Proposed Forest Land and Resource Management Plan (proposed Forest Plan) were issued for public review and comment in February, 1990. A 120-day comment period was provided. During the public comment period, the northern spotted owl was listed (on June 22, 1990), as "threatened" throughout its range, which includes the Shasta-Trinity National Forests. This listing was undertaken by the USDI Fish and Wildife Service (F&WS) in accordance with the Endangered Species Act of 1973, as amended. Subsequently, on September 30, 1990, existing management direction for the northern spotted owl was halted, including the Spotted Owl Habitat Areas (SOHAs).

At the same time, it was determined that the Forest Service would conduct land and resource management activities that were not inconsistent with the recommendations of the "Interagency Scientific Committee To Address the Conservation of the Northern Spotted Owl", pending: (1) enactment of new legislation; (2) any applicable action by the Endangered Species Committee; (3) adoption of a recovery plan by the F&WS; or (4) the results of further consultation between the Forest Service and the F&WS.

Since the above spotted owl actions came after the issuance of the Shasta-Trinity National Forests' 1990 Draft EIS and proposed Forest Plan, those documents did not address the changes that would occur to the range of management opportunities available. In particular, the above mentioned Interagency Scientific Committee recommended the establishment of habitat conservation areas (HCAs) which were not (and could not be) addressed by the 1990 documents. Therefore, those documents were withdrawn. This revised Draft EIS and proposed Forest Plan address the effects that listing the northern spotted owl would have on the management of the Shasta-Trinity National Forests. Additionally, other state-of-the-art concepts and practices have been integrated into these documents.

Legislative Framework

B

In 1974 Congress responded to the need for coordinated, long-range planning of resource uses within the National Forests by enacting The Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA). RPA was amended by the National Forest Management Act of 1976 (NFMA).

These acts require that comprehensive, long-range Forest Plans replace separate and often uncoordinated resource management plans that had traditionally been used on the National Forests.

The National Environmental Policy Act of 1969 (NEPA) requires that Forests, prior to developing a completed Forest Plan, investigate and make public the following:

1. alternative approaches which could be used in developing the proposed Forest Plan;
2. the environment to be affected by that Plan; and
3. anticipated environmental consequences of the alternatives considered in detail.

Additionally, Council on Environmental Quality (CEQ) regulations, including the document format established in 40 Code of Federal Regulations (CFR) 1502.10, have been followed.

The Proposed Forest Plan

C

From among the four alternative management approaches described in the Draft EIS, one was identified as the preferred alternative. The preferred alternative is the basis for the companion document to this Draft EIS--the proposed Forest Plan. The purpose of the proposed Forest Plan is to provide for multiple use and sustained yield of goods and services in a way that maximizes long-term net public benefits in an environmentally sound manner. The proposed Forest Plan will:

1. Establish Forest-wide multiple use goals and objectives; the objectives are both short-term (10 year) and long-range (50 year) projections;
2. Establish Forest-wide standards and guidelines to fulfill NFMA requirements relating to future management activities;
3. Designate management areas and establish direction applying to future management activities;

4. Designate land suitability for timber production;
5. Establish a timber harvest level;
6. Make non-wilderness multiple use allocations for those roadless areas released by the 1984 California Wilderness Act;
7. Include monitoring and evaluation requirements;
8. Guide the management of the Shasta-Trinity National Forests for the next 10 to 15 years; and
9. Allocate National Forest land to the combination of resource management activities for which it is most suited.

Upon its approval and implementation, the Forest Plan will:

1. Be revised at least every 15 years;
2. Be reviewed every five years to determine the need for more frequent revision; and
3. Be amended, as necessary, by means of the NEPA process.

D Relationship with Past and Future Planning

When approved, the Forest Plan will also supersede the following individual plans now being used to manage the Shasta-Trinity National Forests:

1. Ranger District Multiple-Use Plans;
2. Timber Management Plan (1975); and
3. Unit Plans for:
   a. Medicine Lake Highlands, and
   b. Upper Trinity.

In addition, the program direction and standards and guidelines from the following plans would be incorporated by reference and be brought into conformance with the proposed Forest Plan, where necessary:

1. Pacific Crest Trail Management Plan;
2. Management Plan for the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA);
3. Off-Highway Vehicle (OHV) Management Plan;
4. Yolla Bolly-Middle Eel Wilderness Management Plan;
5. Forest Transportation Management Plans;
6. Land and Water Conservation Fund Plans; and the
7. South Fork Trinity River Wild and Scenic Management Plan.

In addition to superseding or incorporating existing plans, resource/implementation plans would be developed during the planning period (i.e., Wild and Scenic River management plans). These special area management plans and implementation plans, intended for specific resources or programs, would rely on the Forest Plan for a broad "umbrella" of direction. These plans would be in compliance with and incorporated into the Forest Plan as completed.

Finally, the Pacific Southwest Region Vegetation Management for Reforestation Final EIS is incorporated in the proposed Forest Plan by reference.

E The Hierarchy of Forest Service Planning

The Forest Service has a three-level hierarchy of integrated land management planning. Individual Forest Plans are only one part of the overall Forest Service planning effort.

At the National level, and based on information received from nine Forest Service Regions nationwide, the RPA recommended program sets direction and assigns targets to the Regions for producing goods and services.

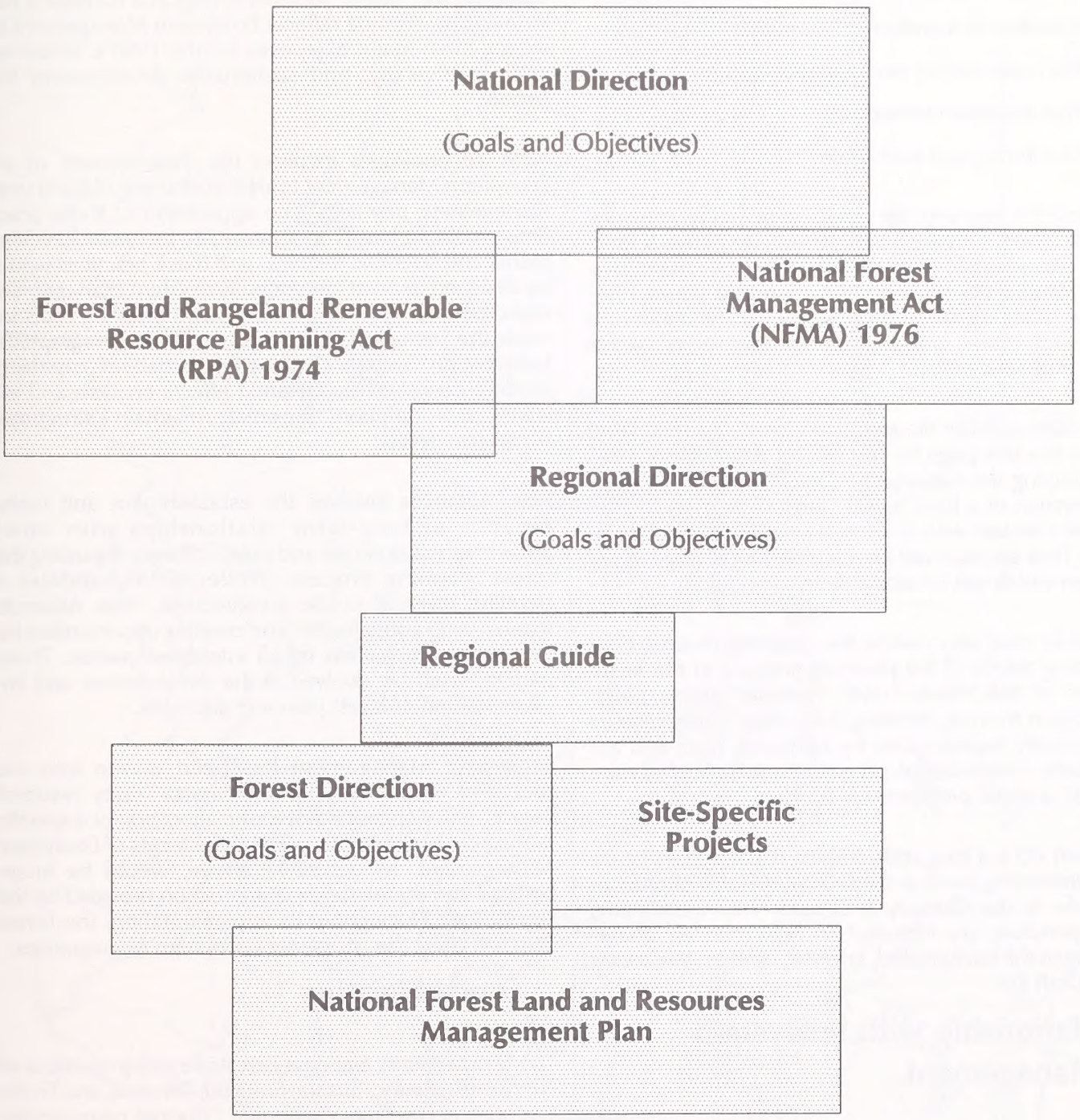
At the Regional level, a Regional Guide is developed to provide direction and disaggregate its share of the national production levels to its Forests. The 1984 Regional Guide for the Pacific Southwest Region (Region 5) covers 18 National Forest units which administer 20 million acres of public land.

At the Forest level, each Forest Plan validates or provides a basis for changing the production levels assigned by the Region. On-the-ground activities and projects carry out the direction developed in the Forest Plan. These local projects use Forest Plan direction and the Final Environmental Impact Statement (Final EIS) as a basis for local project environmental analyses. This process allows "tiering" to the broader documents. Incorporating the Forest Plan and Final EIS by reference also permits concentration on issues specific to smaller projects. Similarly, the Forest Plan is tiered to the Pacific Southwest Regional Guide, which is tiered to the National RPA Program. (See **Figure I-1.**)

F The Planning Process

The Forest planning process, as specified in the NFMA, uses an interdisciplinary approach which, with public participation, gives consideration to economic, social, and environmental impacts. The planning process includes the following steps:

Figure I-1
Hierarchy of Land Management Planning in the National Forest System



1. Identification of public issues;
2. Development of planning criteria;
3. Inventory of data and collection of information;
4. Analysis of the management situation;
5. Formulation of alternatives;
6. Estimated effects of alternatives;
7. Evaluation of alternatives;
8. Selection of a preferred alternative;
9. Plan approval by the Regional Forester;
10. Plan implementation; and
11. Monitoring and evaluation.

This Draft EIS presents the results of planning steps one through seven, although a preferred alternative is identified. The identification of the preferred alternative, which formed the basis for the proposed Forest Plan, enables other agencies and the public to conduct a meaningful review and provide substantive comments on the proposed action.

Public comments on the proposed Forest Plan and Draft EIS (see the title page for the closing date) will be used in developing the subsequent Final EIS and Forest Plan. The selection of a Final Forest Plan will be made by the Regional Forester who is the responsible official for this action. That decision will be documented in a Record of Decision which will be available to the public.

The public may also review the planning records (files containing details of the planning process) at the headquarters of the Shasta-Trinity National Forests, 2400 Washington Avenue, Redding, California. These records are generally incorporated by reference here and are specifically referenced at several points throughout the Draft EIS and the proposed Forest Plan.

This Draft EIS is a long and complex document. For ease in understanding some of the technical words or phrases used refer to the Glossary in Chapter VIII. Additionally, the appendices are included to help gain an understanding of the background, analysis, options, and intent of the Draft EIS.

G Relationship with Ecosystem Management

In response to the rapidly changing and competing demands placed upon the economic, social, and environmental values of the National Forests, the Forest Service is adopting an initiative known as an ecological approach to management. While Ecosystem Management embraces a wide array of concepts, philosophies, and management techniques, it can best be described as the integration of three facets: New Thinking, New Technologies, and New Alliances.

New Thinking means emphasizing the maintenance of functioning ecosystems, leaving resources biologically resilient to change and looking at each resource from the landscape perspective. Instead of focusing on what should be taken from the forest, projects would look at what should be left (i.e. desired future condition). For example, the Pacific Southwest Regional Forester's Environmental Agenda reflects Ecosystem Management in setting three major objectives for the 1990's: preservation, biodiversity, and sustainable development for people.

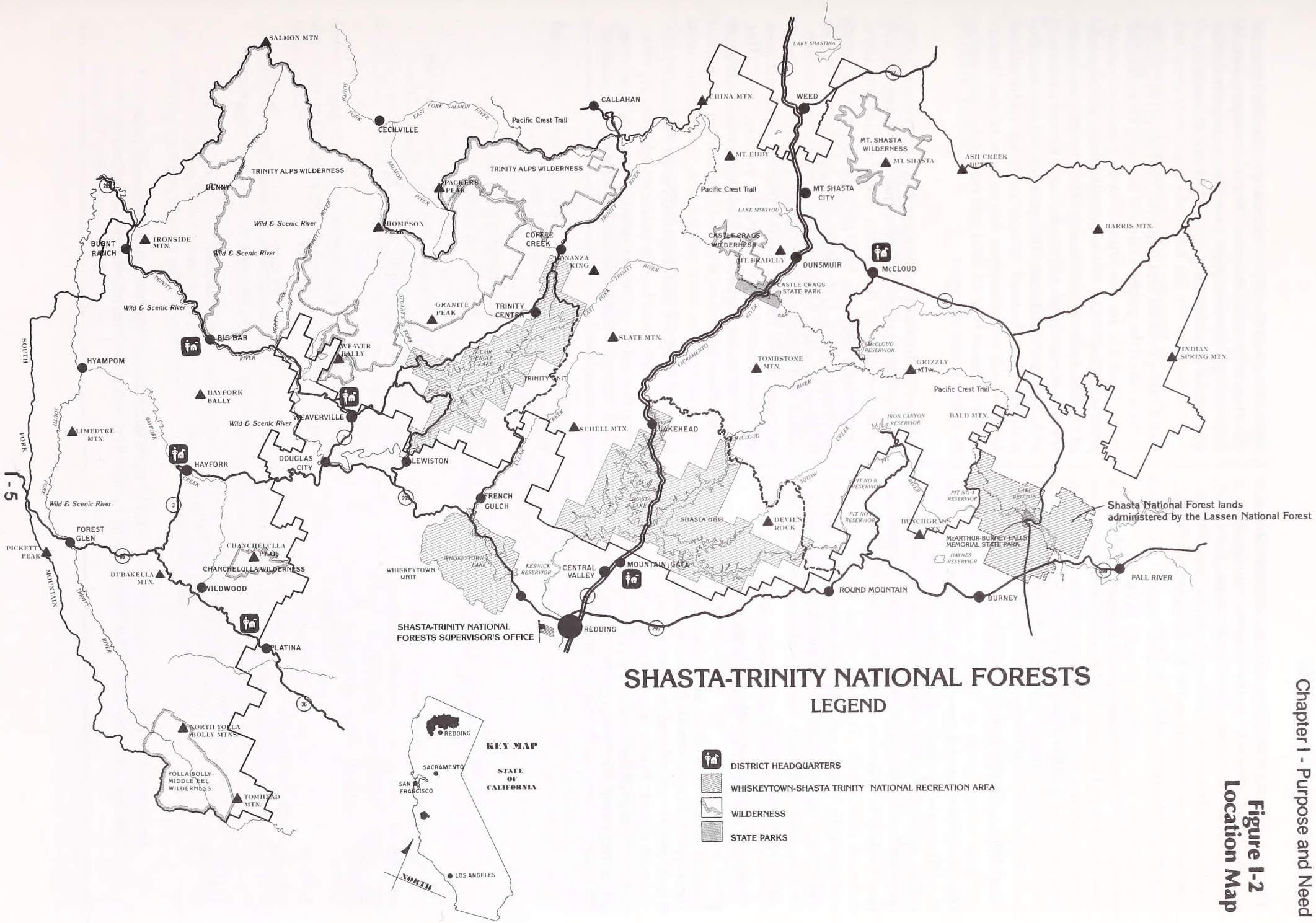
New Technologies involves the development of an Ecosystem Management tool kit containing old and new management practices. The application of these practices would be based on appropriate technical developments and scientific findings, and these practices would be designed to meet integrated Ecosystem Management objectives. For example, existing and evolving tools include the Ecological Unit Inventory (EUI), Geographical Information System (GIS), wildlife habitat capability models, cumulative watershed effects analysis and silvicultural prescriptions that create/maintain a structurally complex forest.

New Alliances involves the establishment and maintenance of long-term relationships with other governmental agencies and public citizens regarding the forest planning process. While NEPA mandates a baseline level of public involvement, New Alliances means going a step further and creating opportunities for thorough participation by all interested parties. These parties would be involved in the development and implementation of forest planning decisions.

Ecosystem Management has been woven into the proposed Forest Plan for the Shasta-Trinity National Forests. This concept is not a land allocation or a specific management prescription. The three facets of Ecosystem Management, as described above, would be incorporated into the management direction provided by the Forest Plan. Throughout its implementation, the Forest Plan will chart the course for Ecosystem Management.

H Forest Location

The Shasta-Trinity National Forests lie within portions of Humboldt, Modoc, Shasta, Siskiyou, Tehama, and Trinity Counties in Northern California. Principal communities within the influence of the Shasta-Trinity National Forests include: Hayfork, Lewiston, Mt. Shasta, McCloud, the greater Redding area, and Weaverville (See **Figure I-2**). The largest is the city of Redding with a population of about 70,000 residents.



SHASTA-TRINITY NATIONAL FORESTS

LEGEND

Figure I-2
Location Map

The Shasta-Trinity National Forests are divided into seven Ranger Districts where on-the-ground management is delegated to a District Ranger. The Mt. Shasta, McCloud, and Shasta Lake Ranger Districts are on the Shasta Forest. The four Ranger Districts on the Trinity Forest are Big Bar, Hayfork, Weaverville, and Yolla Bolla.

Interstate 5 (the major north-south freeway on the West Coast) and State Highway 299 (the major east-west route across Northern California) enhances visitor access to an area rich in recreation opportunities. Mt. Shasta, Shasta Lake, Clair Engle (Trinity) Lake, and the Trinity Alps and Yolla Bolly-Middle Eel Wildernesses are the most popular recreation destinations on the Forests.

The administrative unit covered by the proposed Forest Plan (the planning area) encompasses approximately 2.8 million acres. Excluding privately owned and other non-National Forest lands, more than 2.1 million acres remain (see **Table I-1**). This area excludes approximately 89,000 acres of the Shasta National Forest which are administered by the Lassen National Forest. (The Shasta and Trinity National Forests were proclaimed separately by Congress, but they were combined into one administrative unit in 1954).

Scope of Public Issues Addressed

The scoping process results in the identification of public issues which are related to the management of the National Forest. Public issues indicate the scope and nature of the analysis needed for the Draft EIS, and they act as blueprints in the structuring of alternatives. The issues represent important reasons for considering changes in management direction. They are instrumental in formulating alternatives and in understanding the consequences of implementing any one of the alternatives.

The scoping process first began in 1979 when the Forest Service asked the public to submit issues to be addressed in the Draft EIS for the Shasta-Trinity National Forests' proposed Forest Plan. Three-hundred thirty (330) pieces of correspondence, containing about 2,000 comments, were received. These comments were sorted, classified, screened, and analyzed. This process insured that the planning effort focused directly on those major public issues which will determine future uses of the Shasta-Trinity National Forests' land and resources. Ultimately, 25 public issues emerged.

Subsequent to the initial scoping that took place in 1979, a Draft EIS and proposed Forest Plan were published and made available to the public; these documents were released on August 16, 1986. Although the Draft EIS and proposed Forest Plan were later withdrawn by the Regional Forester, the public comment period was completed, and more than 1,300 responses were received. A summary of the content analysis process was developed and made available to the public in May, 1987. This phase of the scoping process lead to the identification of 30 public issues.

A second Draft EIS and proposed Forest Plan were published and distributed to the public on February 27, 1990. When the public comment period was completed, over 1,500 letters or postcards had been received. However,

Table I-1
Shasta-Trinity National Forests
Net Acreage by County
(as of September 1991)

County	Shasta NF	Trinity NF	Shasta-Trinity NF	Percent of Net Shasta-Trinity Acres in the County
Humboldt	0	2,465	2,465	<1
Shasta	407,864	31,918	439,782	21
Siskiyou	431,745	0	431,745	20
Tehama	0	76,947	76,947	4
Trinity	228,751	941,857	1,170,608	55
TOTAL	**1,068,360**	1,053,187	***2,121,547**	100

* Acreages do not include approximately 89,000 acres administered by the Lassen National Forest. This figure includes all of the Shasta-Trinity National Forests' land that is within Modoc County.

for reasons previously described in this chapter, this Draft EIS and proposed Forest Plan were later withdrawn. All of the public comments were analyzed and used to revise the 21 issues in this document. Some of the public issues that were previously identified did not warrant further consideration; they were either dropped or combined with other issues.

More detailed information on the scoping and content analysis processes can be found in Appendix A and in the planning records located at the Supervisor's Office. Following is a list of the public issues being addressed in this Draft EIS.

Public Issues

Cultural Resources

Issue #1 How should the Forests effectively provide identification, protection, and interpretation of archaeological, historical, and religious sites?

Many traditional Indian religious sites/areas or practices, such as the gathering of religious materials, involve National Forest lands. In addition, there are numerous archaeological and historical values on these lands.

Biological Diversity

Issue #2 How should the Forests' vegetative resources be managed for ecosystem diversity? Special consideration would be given to providing habitats that maintain or enhance populations of threatened and endangered (T&E) species and viable populations of sensitive species and/or management indicators.

There is public concern that a wide variety of ecosystems should be maintained on the Forests to specifically provide for the:

1. Maintenance and/or enhancement of habitats for Federally listed T&E species (plants and animals);
2. Maintenance and/or enhancement of habitats sufficient to provide for viable populations of all other existing species (plants and animals);
3. Maintenance and/or enhancement of the Forests' ecosystems and the biodiversity (plants and animals) associated with them; and
4. Maintenance and/or enhancement of special elements or components of these ecosystems (i.e., snags, down logs, cliffs, vegetative seral stages, etc.)

Issue #3 How much of the older vegetative seral stages existing on the Forests should be retained?

There is public concern that sufficient amounts of old growth habitats be retained and/or enhanced on the Forests to provide for the:

1. Viability of all species (plants and animals) requiring this type of habitat for all or part of their life cycle; and
2. Sufficient representation and retention of this ecosystem component for the sake of maintaining vegetative biodiversity.

Facilities

Issue #4 How many miles of additional roads are needed and to what standard should they be constructed and maintained in order to meet future needs?

Roads create impacts directly on the landscape and indirectly on other resources by making access easier for users. At issue is the amount of additional roading needed and to what standard they should be maintained. Also of concern is whether or not the roads should remain open to public use.

Fire and Fuels

Issue #5 To what extent should prescribed burning be used as a way to reduce fuel hazards, prepare sites for reforestation, and improve wildlife habitat?

Prescribed burning is the intentional burning of a predetermined area for planned objectives. At issue is the Forest Service's ability to balance beneficial uses of prescribed fire with the negative consequences of burning, such as smoke, energy waste, loss of soil protection, and modification of wildlife habitat.

Fisheries/Water

Issue #6 How should watersheds be managed to maintain or enhance water quality and fisheries?

The Shasta-Trinity National Forests contain the headwaters of two important watersheds in the State: the Sacramento and Trinity Rivers. These watersheds provide high quality water that has a broad variety of uses, including that of supporting an important anadromous fishery (salmon and steelhead).

Human and Community Development

Issue #7 What activities and outputs should be provided to maintain community stability?

For most small communities stability is largely a matter of economics. Forest activities affect local economies in several ways: (1) jobs are created from Forest resources, primarily timber harvesting; and (2) payments of Forest Service shared receipts help build roads and support local schools.

Minerals

Issue #8 How can mineral development and exploration be encouraged while minimizing adverse impacts to non-mineral surface resources?

Concern exists that minerals and energy development is not being recognized as a valid use of National Forest land.

Range

Issue #9 Is livestock grazing an appropriate use of Wilderness? If so, how should conflicts be minimized between livestock use and recreationists?

There is concern that livestock grazing can degrade the attributes associated with primitive recreation within Wilderness.

Issue # 10 How should livestock grazing be managed to minimize degradation of riparian areas?

There is concern that livestock grazing in riparian areas diminishes vegetation, breaks down stream banks, and adversely affects fish and wildlife habitat, as well as water quality.

Recreation

Issue #11 How much of the Forests should be open, closed, or restricted to off-highway vehicle (OHV) use?

Concern exists that OHV use can cause damage to other resources, such as soils and wildlife. The use of OHVs has increased while the lands open to this use have diminished. Conflicts can also occur between various OHV users and other recreationists.

Issue #12 How should the Forests supply water-oriented recreation facilities and opportunities to meet increasing demand?

There is a statewide public need for additional water-oriented recreation activities. The Forests have the potential to supply most forms of water-oriented recreation. However, the current supply of support facilities will not meet estimated demand. Conflicts are occurring between different types of use.

Riparian Areas

Issue #13 How wide should riparian management zones (RMZs) be and what management activities should be allowed within them?

Forest management activities have the potential to affect water quality and the fisheries resource on the Forests. Timber harvesting, prescribed burning, and road construction near streamcourses are of particular concern to many people, because these activities have a potential for degrading water quality and fisheries habitat.

Special Areas

Issue #14 What areas should be recommended for Research Natural Area (RNA) and Special Interest Area (SIA) establishment?

This issue relates to the number, size, and location of RNAs to be recommended for establishment on the Forests. RNAs are established: (1) to contribute to the

preservation of examples of all significant natural ecosystems for purposes of research and ecological study; (2) to provide gene pools; and, (3) where appropriate, to protect habitats of T&E and sensitive species of plants and animals.

This issue also relates to SIAs. The objectives of establishing SIAs are: (1) to protect, and, where appropriate, foster public use and enjoyment of areas with scenic, historical, geological, botanical, zoological, palentological, or other special characteristics, and (2) to classify areas that possess unusual recreation and scientific values so that these special values are available for public study, use, or enjoyment.

Timber

Issue #15 Should herbicides be used to control vegetation in order to meet timber management objectives?

There has been growing controversy regarding the use of chemicals, particularly herbicides, for the control of undesirable vegetation in forest plantations. At issue over the use of herbicides is: the effects of herbicides on human health, domestic animals, fish and wildlife; the cost and effectiveness of herbicides as compared to other vegetative control treatments; the need to maintain timber growth and water quality; and the registration of chemicals.

Issue #16 What should the timber harvest level or allowable sale quantity (ASQ) be?

Public opinion is sharply divided on the question of timber harvests. Many people feel that timber harvesting should be increased; others feel that the Forests are being overcut to the detriment of other resources.

Issue #17 What silvicultural practices should be used to assure reasonably successful reforestation of harvested lands and to maintain tree species diversity?

There is concern over the success of the Forests' reforestation program, particularly on the areas that were previously clearcut. There is also concern that the conversion of some nontimber growing areas (i.e., brushfields) to forest plantations reduces deer habitat, resulting in lower deer populations. Public concern has also been expressed over reforesting plantations with a single species of trees.

Issue #18 What harvest methods, including clearcutting, should be used to meet management objectives?

Public concern over the practice of clearcutting has occurred mainly because of the appearance of the clearcut, the effects on water quality, and the possibility of herbicide use to reestablish new stands.

Visual Quality

Issue #19 How and where should visual quality be protected and enhanced?

Visual effects of management practices have become more apparent in recent years. There is public concern that scenic quality has declined overall and that certain silvicultural practices and road building activities have contributed to this decline. There is also concern that visual quality does not receive adequate emphasis. This is most notable along sensitive travel corridors. Others feel that visual resource practices are too restrictive on management activities, particularly timber harvesting and mining.

Wild and Scenic Rivers

Issue #20 What river segments should be recommended for inclusion in the Federal Wild and Scenic Rivers system?

Portions of the New River, the North Fork and South Fork of the Trinity River, and the Trinity River were added to the National Wild and Scenic Rivers System in 1981. Several other major rivers and streams on the Forests have the potential for Wild and Scenic River designation. This designation would maintain examples of pristine aquatic and riparian ecosystems and provide river-oriented recreational opportunities. There is concern that designation would restrict other management activities, such as timber harvesting, and adversely affect private inholdings.

For those rivers that have a high percentage of private lands there is concern by private landowners (especially along the McCloud River) that access and land use would be restricted.

Wilderness and Roadless Areas

Issue #21 How should the Forests' roadless areas be managed, including the Mt. Eddy further planning area?

Approximately 498,776 acres, or 24 percent of the Shasta-Trinity National Forests, are designated in five Wildernesses. One roadless area, Mt. Eddy, was designated for further planning and is evaluated for wilderness designation as part of the Forests' planning process. The 1984 California Wilderness Act stated that those roadless areas, not designated as either wilderness or further planning, be managed for multiple-use purposes, and that they be reviewed again for the wilderness option when the Forest Plan is revised in 10-15 years. At issue are management activities that would occur in some of the undesignated roadless areas between now and the next revision of the Forest Plan.

Again, it should be noted that these issues are important considerations in the development of the alternatives in the Draft EIS and the proposed Forest Plan.

CHAPTER II

Alternatives Including the Preferred Alternative

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Chapter II - Alternatives Including The Preferred Alternative

Introduction

A

This chapter describes the alternatives and benchmarks examined during the land management planning process. The major topics discussed include:

1. **Alternative Development Process** - This section describes an alternative; discusses the regulations applicable to the development of alternatives; describes how Forest alternatives were developed; and discusses the range of alternatives and factors that limit the range;

2. **Benchmarks** - Describes the purpose and function of benchmarks and gives the analysis and conclusions for each;

3. **Alternatives Considered But Eliminated From Detailed Study** - Describes the alternatives eliminated and the rational for dropping them;

4. **Alternatives Considered in Detail** - Describes and compares each of the alternatives and discusses management direction common to all alternatives.

Alternative Development Process

B

Description of an Alternative

An alternative is a set of goals and objectives that is centered around a specific theme. This theme guides the management of forest resources from the current condition to a desired future state.

Alternatives constitute the heart of the environmental analysis process described in the National Environmental Policy Act of 1969 (NEPA) regulations. The proposed action, various alternatives, and "no action" are considered in comparative form to sharply define the issues and provide a clear basis for choice to the decision maker and the public. NEPA regulations also require that the alternatives eliminated from detailed study be identified and discussed.

The National Forest Management Act of 1976 (NFMA) regulations specify that the primary goal in formulating alternatives, in addition to NEPA compliance, is to "Provide an adequate basis for identifying the alternative that comes nearest to maximizing net public benefits." Net public benefits are the overall long term value to the Nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. See Appendix D for further details.

NFMA regulations also state that a reasonable range of alternatives should be formulated with the goal of achieving multiple use objectives. In particular, the alternatives should meet the following criteria:

1. Each alternative would be capable of being achieved;

2. An alternative would be formulated showing the most likely condition expected to exist if current management direction continued;

3. Each alternative would provide for the orderly elimination of backlog areas needing treatment for restoration of renewable resources as necessary;

4. Each identified major public issue would be addressed in one or more of the alternatives; and

5. Each alternative would present, to the extent practicable, the most economically efficient combination of management practices that can meet the objectives established. The measure of cost efficiency is Present Net Value (PNV).

Additionally, each alternative is to state the conditions and uses that would result, the goods and services to be produced, the resource management standards and guidelines to be followed, and the purposes of the management direction proposed.

The alternatives described in this chapter are based on management themes. A set of management prescriptions is then applied to specific areas of land in a unique combination that is guided by the alternative theme.

A management prescription is a set of practices used to manipulate certain lands and resources for a particular purpose, such as timber production, recreation, or wildlife.

The number of alternatives for managing over 2.1 million acres of National Forest land with the diversity of the Shasta-Trinity National Forests could be limitless. Therefore, the ultimate choice of which alternatives to present must be based on some type of systematic approach. This approach is discussed below.

Description of the Process Used to Develop Alternatives

The formulation of alternatives is the culmination of five steps in the NFMA planning process. The following summarizes how these steps were accomplished. A more detailed discussion of these actions, particularly those related to FORPLAN (a linear programming model), can be found in Appendix B.

1. Major public issues were identified through public involvement efforts. Management concerns, originating from within the Forest Service organization, were added to the public issues (refer to Appendix A). Public issues, management concerns, and resource opportunities were then consolidated into a series of issue statements (refer to Chapter I). The issues developed during the initial public involvement effort were modified as a result of public comments received on the previous Draft Environmental Impact Statement (Draft EIS). That document was withdrawn in 1986. Management concerns were either dropped or elevated to public issues depending on the comments received. A subsequent Draft EIS was issued in February 1990. Although that draft was not followed by a Final EIS, the public comments received as a result of that draft were used to further refine the issues.

2. In order to respond to the issue statements a set of 11 Management Prescriptions was developed. These prescriptions contain 'emphasized' and 'permitted' practices. (See Chapter IV of the proposed Forest Plan). A suitability analysis, using resource suitability models, was then conducted to determine which activities were feasible on specific units of land. This analysis also identified the best resource opportunities for applying the prescriptions depending on the theme of an alternative.

3. To match the needs of the public, as evidenced by the public issues, and the capability of the Shasta-Trinity National Forests to respond to these needs, geographically distinct capability areas were developed.

4. The capability areas were then combined into analysis areas based on commonality of physical attributes, suitability, productivity, and public issues.

   These analysis areas formed the basis for putting information into FORPLAN. This linear programming model was used to allocate prescriptions and schedule outputs over time.

5. For each FORPLAN analysis area a range of suitable FORPLAN prescriptions was identified. Following this the costs and outputs associated with applying various FORPLAN prescriptions to the analysis areas were calculated.

6. The next series of tasks was related to the objective of analyzing the management situation on the Forests from the standpoint of minimum and maximum supply potentials, resource conditions, resource opportunities, demand projections, and needed changes in management direction. Both FORPLAN and the Forests' Data Base were useful in establishing the boundaries within which a range of feasible alternatives could be developed. These minimum and maximum supply potentials were used as benchmarks (see Benchmarks in Section C of this Chapter) during the analysis process.

   To document this analysis, a series of papers was prepared. These papers constitute the Shasta-Trinity National Forests' Analysis of the Management Situation (AMS), which resulted in the Affected Environment (see Chapter III.)

7. The final phases of the alternative development process involved the development of a set of economically efficient alternatives within the feasible range defined by the benchmarks. To meet this objective, the following tasks were carried out:

   (a) A Forest Interdisciplinary (ID) Team developed a set of alternative themes and emphasis statements in response to NFMA regulations, Forest and Rangeland Renewable Resources Planning Act (RPA) direction, regional direction, public issues, and Forest capabilities.

   (b) FORPLAN was then used to determine the most cost efficient mix of prescriptions for each alternative. Minimum management requirements (MMRs), and minimum implementation requirements (MIRs) were incorporated into FORPLAN as restrictions in all alternatives. The ID Team added other restrictions to the FORPLAN model based on the unique resource emphasis of each alternative. These additional constraints, and the rationale for each, are discussed in Appendix B.

   (c) FORPLAN then selected prescriptions to be applied to each analysis area based on PNV and other objectives. Periodic checks were performed using the Forests' Data Base and the suitability models developed earlier to ensure that the FORPLAN solutions were spatially logical and implementable on the ground. Where necessary, the ID Team adjusted the FORPLAN restrictions to produce a feasible schedule of outputs and prescriptions within the theme of the alternatives.

8. The Forests' management team divided the Forests into 22 Management Areas and assigned

management prescriptions to each. These management prescriptions are consistent with the FORPLAN solution.

9. Lastly, the alternatives were compared in terms of PNV, output levels, effects, and response to public issues. This information presented the Forest Supervisor with the facts necessary to recommend a preferred alternative to the Regional Forester. The preferred alternative is presented as one of the alternatives in this document.

Characteristics Which Limit the Range of Alternatives

The range of alternatives considered on the Shasta-Trinity National Forests is limited by physiographic/topographic and political factors. These limitations are:

1. **Classified Areas:** The Castle Crags, Chanchelulla, Mt. Shasta, Trinity Alps, and Yolly-Bolly Middle Eel Wildernesses, totalling 498,776 acres (about 24 percent of the Forests), will not be subject to re-evaluation or change as a result of this planning. The classified Wild and Scenic Rivers fall into this category as well as 106.4 miles of the Trinity River system. The Shasta Mud Flow Research Natural Area, containing 3,115 acres, is also in this category.

2. **National Recreation Areas:** The Shasta Unit (of the Whiskeytown-Shasta-Trinity National Recreation Area [NRA}) containing 115,138 acres, and the Trinity Unit, containing 60,145 acres, are both restricted as to the type and intensity of management that may take place. For instance, regulated timber harvest is prohibited in the Shasta Unit and sharply restricted in the Trinity Unit.

3. **Released Roadless Areas:** By law, wilderness is not an option to be considered for the 29 released roadless areas on the Forests during this planning cycle.

4. **Physical Factors:** About 49 percent of the Forests' land base is not suitable or available for timber production. Only 30 percent of the Trinity National Forest and 40 percent of the Shasta National Forest contain lands with less than 40 percent slopes. Management activities are limited on slopes in excess of 40 percent. Nearly 6 percent of the Forests most productive growing sites are on highly unstable landscapes which severely restrict management options.

5. **Threatened and Endangered Species:** Approximately 500,000 acres of land formally considered suitable for timber harvest are unavailable until the habitat requirements for the northern spotted owl are scientifically determined. Since the best available information estimates that it may take 50 years to determine the owl's habitat needs, no timber harvest is programmed from those acres in any alternative.

Establishing a Range of Alternatives

Through the development of benchmarks it was possible to analyze a broad range of reasonable alternatives for each resource or combination of resources. This includes a minimum management level benchmark at the lower bounds and a series of single resource emphasis benchmarks at the upper bounds. Factors which demonstrate that a broad range of alternatives has been considered in this document include:

1. The range of alternatives is well distributed between the minimum level benchmark and the maximum single resource benchmarks;

2. All of the public issue statements are addressed by one or more alternatives;

3. A wide variety of prescriptions is applied to the available land base in the various alternatives. **Table II-14** shows the allocation of prescriptions among the alternatives;

4. Various resources show a wide range of outputs between alternatives. For instance, the allowable sale quantity (ASQ) in the first decade ranges from a low of 65.3 million board feet (MMBF) to a high of 112.4 MMBF. The range of different resource outputs and allocations is demonstrated in **Table II-16** and **Table II-17**.

Benchmarks

C

Benchmarks exhibit the following characteristics:

- They display physical, ecological, and technical capabilities;
- they are not limited by Forest Service policy or budget, discretionary constraints, spatial feasibility, or program and staffing requirements;
- they are physically and technically, but not necessarily operationally, implementable;
- they are not alternatives in the sense of providing a total integrated program of management.

The purposes of benchmarks are:

- To provide a reference point for comparing alternatives;
- to provide an analytical base for the development of alternatives;
- to explore the resource potential and current resource condition; and
- to display the need for change and the decision space within which change can occur.

Conclusions Reached From Study and Analysis of Benchmarks

Following are the basic descriptions of ten benchmarks and the significant findings that were learned from each. Selected outputs from the benchmarks are displayed in **Table II-1**. A more complete discussion of how each benchmark was modeled is contained in Appendix B.

FLW - Maximum Present Net Value (PNV) with Flow and Long-Term Sustained Yield (LTSY) Constraints Benchmark. This benchmark demonstrates the most economically efficient level of resources that can be produced with only those constraints applied that assure technical feasibility. Minimum Management Requirements (MMRs) are not applied to this benchmark. Therefore, it is also used as the basis for evaluating the effect of MMRs on PNV. The objective function of the FLW benchmark is to maximize PNV.

Although this benchmark produces the greatest PNV possible from the Forests, it does not fully address the issues and legal requirements associated with water quality and wildlife diversity. Conditions would fall below those needed to maintain viable populations of some wildlife species, and thresholds of concern would be exceeded from a water quality standpoint. In addition, FLW does not fully respond to issues or concerns related to visual quality maintenance and enhancement.

The FLW benchmark established a maximum physical and biological capacity of 610 MMBF per year in the 1st decade for timber outputs but timber outputs would reduce to 319 MMBF by the 5th decade and continue to be reduced in the following decades due to declining inventory. This high rate of timber harvesting was the major factor in generating the highest water yield of any benchmark. This benchmark, therefore, established the maximum capacity for water yield for the Forests. Recreational demands were also met. Under FLW grazing outputs would increase to 67,000 animal months (AMs) per year, a result of special management and type conversion from brush to grass through fire and seeding.

Late seral stage wildlife habitats on suitable timber lands would be deficient for wildlife needs because of intensive stocking control on recently harvested areas and a more rapid removal of mature timber stands. Viability for threatened and endangered (T&E) species would not be maintained, and the viability of species associated with large blocks of older over-mature timber could not be assured. Deer numbers are the highest of any benchmark because of the large amount of early seral stages created and the amount of direct habitat improvement initiated.

H2O - Water Yield Maximization Benchmark. The objective of this analysis was to define the maximum capability of the Forests to provide water over the 1990 RPA planning period, subject to MMRs and maximization of PNV. This benchmark was useful in identifying the maximum capabilities of water yield on the Forests obtained by timber harvest and conversion of brush to grass. It also showed that total water yields could be increased only slightly from naturally occurring levels. Achieving the maximum water yield caused an increase in PNV compared to the MMR benchmark (described below).

The H20 benchmark addressed most market related issues but failed to adequately address non-market values, especially visual quality.

Timber outputs would be lower than under the MMR benchmark. Water quality outputs in the form of equivalent roaded acres (ERAs) exhibit the same characteristics found in the MMR analysis. Range outputs are similar to the RGN benchmark (below) as a result of the early seral stage emphasis. Wildlife outputs are not measurably different from all other benchmarks except FLW, because MMRs result in the allocation of a large portion of the land base to prescriptions that minimally disturb the landscape.

MKV - Maximum PNV-Market Values Only Benchmark. The objectives of this benchmark were: (1) to display the outputs and costs which would result from maximizing the PNV of outputs having market prices; and (2) to provide the relative proportion in PNV between market and assigned (or non-market) outputs when

compared with the MMR benchmark analysis. Only timber, grazing, developed recreation, and anadromous fish production are valued.

This benchmark best responds to issues relating to the production of market outputs and services. It does not fully deal with issues related to non-market benefits such as dispersed recreation, wilderness opportunities, and maintenance and enhancement of visual quality objectives. Results of this analysis, and comparison with the MMR benchmark, indicated that timber outputs for the first 5 decades averaged three percent lower than MMR timber outputs.

Average recreation visitor day (RVD) outputs would be lower than the outputs from the MMR benchmark, because only developed recreation was valued. Likewise, wildlife user days (WUDs) were lower because only induced outputs for wildlife were counted.

MLV - Minimum Level of Management Benchmark. The minimum level benchmark shows the unavoidable costs and benefits of public ownership of the Forests. It establishes a basis for comparing controllable outputs and discretionary costs and benefits of the various alternatives. Management activities are limited to those needed to protect life, health, and safety; to prevent environmental damage; and to manage unavoidable land uses. Production activities, such as timber harvest, developed recreation, and livestock grazing are not included. The objective function is to minimize costs.

While minimum level management can be achieved with a significant decrease in costs, it also has a significant decrease in PNV. PNV is the lowest of any benchmark. Minimum level management does not conform to existing legislation governing management of the Forests nor does it satisfactorily address Forest issues. The largest portion of the cost included in MLV is associated with fire protection and suppression.

MMR - Minimum Management Requirements Benchmark. This benchmark, when compared to the FLW benchmark, illustrates the opportunity costs involved in collectively meeting MMRs. MMRs are basic resource protection requirements attributable to laws and regulations which are beyond the Forest Service's ability to change. It also forms the basis for evaluating alternative requirements in addition to the MMRs. The objective function is to maximize PNV.

This benchmark fully addresses the issues and concerns relating to economic levels of all priced outputs and associated consequences. It also responds to issues relating to maintaining water quality, vegetative diversity, and viable populations of wildlife species. It does not fully respond to non-priced benefits such as visual quality, riparian area management, and semi-primitive recreation.

A series of analyses was performed in conjunction with this benchmark to show the marginal effects and costs of each of the major MMRs. The following elements of the MMR benchmark were individually examined in a series of sensitivity analyses:

- Non-declining yield policies (analysis);
- viable population-diversity requirements (focusing on spotted owl requirements);
- water quality/cumulative watershed impact requirements;
- threatened and endangered species requirements;
- dispersion requirements; and
- perennial riparian area management requirements.

The conclusions reached after analyzing each of the above sensitivity analyses are discussed later in this Chapter.

A timber output of 134 MMBF was achieved under benchmark MMR in the 1st decade, which equates to a decrease of 78 percent from FLW in the 1st decade. Timber outputs average three percent higher than the MKV benchmark for the 5 decades analyzed.

All recreational demands were met.

Forage outputs under this benchmark reached 34,000 AMs annually in the first decade. Fewer acres were converted from brush to grass than was the case under FLW.

Late seral stage wildlife habitats on tentatively suitable timber lands are reduced but increase on the Forest as a whole. Viability for all species would be maintained. Enhancement of T&E and selected sensitive species habitats would occur.

NON - Maximum Non-Wilderness Benchmark. This benchmark was not analyzed. The MMR analysis did not allocate the Mt. Eddy area to Wilderness, and, therefore, this analysis was not necessary to determine effects. Results and findings are the same as shown for the MMR benchmark.

RGN - Range Maximization Benchmark. The intent of this analysis was to define the maximum capability of the Forests to provide commercial livestock grazing over the next 50 years, subject only to MMRs. The objective function of this benchmark is to maximize livestock forage. Few issues, if any, were satisfied by this benchmark, especially those related to non-market benefits.

All areas with suitable forage and available for livestock production were included in this analysis. Maximizing the range resource shows that a 5-decade average of 39,200 AMs/year is possible. This compares to only 33,800 AMs/year in the MMR benchmark. A lower proportion of timber lands are intensively managed for timber. This is due to non-release in regenerated timber stands in order to provide additional forage, resulting in timber outputs 9 percent lower than the outputs from the MMR benchmark in the first 2 decades. Cumulative watershed impacts were not measurably different from MMR.

Because of extensive conversion of vegetation types to more flammable fuel types, burned acres would be higher than MMR.

Wildlife outputs would be similar to MMR because of the dominant restrictive effect MMRs have on potential activities allowed on the overall land base.

TBD - Maximize Timber Outputs for One Decade-Departure Benchmark. The purpose of this benchmark was to establish the maximum timber output which could be attained in the first decade subject to MMRs with the non-declining yield policy removed.

This benchmark did not adequately respond to the Forests' issues, from the standpoint of economic stability to the timber industry-dependent communities, nor did it respond to non-market related issues.

Benchmark TBD fully responded to the timber-related issues only in the short term (i.e., the 1st decade of the planning period). First decade harvest was 165 MMBF, 19 MMBF higher than the TBR benchmark (below). However, over the 5 decade period timber harvest was 13 MMBF less. Other outputs and effects of TBD were similar to TBR.

TBR - Maximize Timber Outputs Benchmark. A major purpose of this analysis was to establish the maximum production levels in timber harvesting subject to timber policy constraints, MMRs, and economic efficiency. The objective function of this benchmark was to maximize timber in the first decade.

This analysis adequately addressed the timber harvesting-related issues. The benchmark did not fully address non-timber related issues.

When comparing this analysis with the MMR analysis, timber volumes harvested were 9 percent higher with a one percent decrease in PNV. However, the 146 MMBF would cause an increase in cumulative watershed impacts (as displayed through the ERA outputs). This increase in watershed disturbance would also impact the fisheries programs and create the need for increased habitat improvement work in order to meet future demands for both anadromous and inland fisheries. This benchmark would not respond to non-priced benefits such as visual quality, and riparian area management as well as the MMR benchmark.

Range outputs are similar to the MMR benchmark. Wildlife outputs are similar to MMR as well as the other benchmarks with the exception of FLW.

WLN - Maximum Wilderness Benchmark. The purpose of this analysis was to evaluate the impacts of assigning all further planning areas to wilderness, The Mt. Eddy area, containing 7,720 acres, is the only further planning area on the Forests. Because of the small amount of suitable land within the Mt. Eddy area, placing it in wilderness results in a slight decrease in timber outputs compared to the MMR benchmark. All other outputs remain about the same.

This benchmark specifically deals with the issue concerning the designation and management of wilderness on the Forests. It does not fully address issues related to visual quality and semi-primitive recreation.

Conclusions About Resource Interactions and Capabilities Under the Benchmark Analysis.

General. The maximum resource potential for timber, range, and water indicates the upper production limits possible for resource management, but they are unrealistic to achieve because of high costs, lower PNV, or unacceptable trade-offs with other resources.

Fire Management. The acres to be burned by wildfire are directly related to fuel types created by management activities under each benchmark. The affect of the MMRs which are applied to all benchmarks, except FLW, tend to mask any measurable differences between the benchmarks as they would relate to wildfire potential. Exceptions to this would be H2O and RNG where more acres are being managed at earlier seral stages to provide for water and/or forage. Even the emphasis in these benchmarks probably would not have a significant affect on wildfire acres. Acres burned for all benchmarks are greater than historical levels, primarily due to an accumulation of fuels in later seral stage vegetation.

It should be noted that no changes were made in the base fire organization used in the benchmarks so as to simplify the analysis. That is, there was no attempt to mitigate the number of acres burned by wildfire by intensifying the suppression organization.

Fish. Impacts on fish habitats on the Shasta-Trinity National Forests parallel the impacts on watersheds shown by ERAs resulting from each benchmark. In general,

those benchmarks which resulted in a significant number of acres disturbed would also result in the greatest potential impact on fish habitat. Again, except for FLW, all benchmarks are significantly restricted by MMRs in both the number of acres available for disturbance and the intensity of disturbance. It is expected that all benchmarks, except FLW, would have a similar impact on fisheries and that none would fully respond to riparian related values. The effect of all benchmarks except FLW would be measurably less then historical levels. Although not significant, TBD and TBR would have a greater affect on fisheries than the rest of the benchmarks, except FLW.

Pounds of fish and wildlife user days, both anadromous and inland, are expected to be similar for all benchmarks except FLW. (The projected numbers in **Table II-1** reflect the habitat capability, not actual numbers. Actual numbers are affected by more than habitat and would be reflective of all factors.)

Further Planning Areas. The disposition of the one remaining further planning area (Mt. Eddy) has little effect on resource outputs or PNV.

Range. Range outputs under any of the benchmarks (except MLV) far exceed current existing levels of use for forage. The animal months (AMs) resulting from the benchmarks are triggered by the amount of type conversion and the amount of forage production available in the form of transition range as a result of timber harvest.

Recreation. Unless constrained or not valued RVD outputs always go to the demand cutoff because benefit values far exceed the costs of providing the use.

Timber. Timber capabilities in the 1st decade of the planning period range from a high of 610 MMBF under the FLW benchmark to a low of 107 MMBF under the H2O benchmark. When MMRs are applied to the analysis, however, this range in the solution space decreases from a high output of 165 MMBF under TBD to 107 MMBF under H20. As mentioned earlier, the addition of legal, nondiscretionary requirements to the model had a substantial effect on both PNV and timber outputs in the 1st decade of the planning period.

Other timber conclusions reached from the analysis of the benchmarks are:

- The effect of the non-declining yield constraint on 1st decade timber outputs (MMBF) is significant when the FORPLAN objective function is to maximize timber volume (example: 165 MMBF under the TBD benchmark versus 146 MMBF under TBR benchmark in the 1st decade.
- Under the benchmarks riparian areas along perennial streams are allocated to timber prescriptions stand maintenance or no scheduled harvest.
- About to 5,000 acres per year of regeneration cutting and reforestation is projected (all benchmarks except FLW). This is significantly less than the 7,500 acres the Forests have been averaging over the nine-year period (1980 - 1988).
- With a relatively unconstrained model, most of the tentatively suitable timber land is allocated to even-aged management using clearcutting for the final harvest. The analysis demonstrated that this combination is the most cost efficient.
- Most existing stands, on land suitable for timber harvest, are regenerated within the first 6 decades.
- Few intermediate harvests (e.g., commercial thinning) are scheduled. This indicates that other harvest methods are more cost effective and contribute more towards PNV.
- High site-low cost lands are scheduled for harvest in the early decades. This confirms that the selection was based on PNV.
- With a relatively unconstrained model, very little of the non-stocked, brush, hardwood, or knobcone pine stocked land is reforested. This is true for any benchmark requiring that PNV be maximized.

Visual Quality. Impacts on visual quality are directly related to the number of acres physically altered and the intensity at which they are altered. A proxy of degree and intensity of disturbance is provided by the outputs of acres altered by management activities shown as "Effective Alteration" ("EFFALT") under the FORPLAN reports. The acres altered are similar for all benchmarks, except FLW, and are less then historical levels. This is due to the significant affect application of MMRs has to all benchmarks.

Water Quality. Outputs in ERAs provide a comparison of the level of water quality which could occur under each benchmark. The levels are directly related to the amount of acres that are disturbed. FLW, TBR, and TBD represent those benchmarks where disturbance is the highest but only FLW is beyond acceptable limits. TBR and TBD are similar to the other benchmarks and disturbance is below historical levels.

Water Yield. Water production outputs do not vary by more than 10 percent when compared to a background water yield except for FLW. Water yields have relatively little influence in the analysis except that the benefit values for water can cause brush conversion to take place and certain timber stands to be harvested that would otherwise be uneconomical.

Wildlife. The viability of wildlife species is generally related to the proportion of lands allocated to intensive timber management prescriptions. Intensive timber management prescriptions tend to reduce the amount of

later seral stages (4a, 4b-c, and 4c-older) down to the 5 percent level which is the minimum management requirement for diversity. Due to the affect of MMRs, none of the benchmarks, except FLW, would result in a reduction of later seral stages.

Table II-1
Average Annual Outputs and Activities, Decades 1 through 5

	BENCHMARK*								
Activity / Resource	**FLW**	**H2O**	**MKV**	**MLV**	**MMR**	**RGN**	**TBD**	**TBR**	**WLN**
Economics									
Present Net Value (PNV)									
MM$	10,454	8,841	8,685	6,588	8,777	8,670	8,692	8,703	8,787
Total Cost - Million Dollars {MM$}									
Base Year (1989) 44									
Decade 1	121	63	63	31	62	63	65	62	61
Decade 2	84	57	57	32	57	57	58	59	56
Decade 3	87	61	61	32	61	60	59	63	60
Decade 4	83	66	66	32	62	66	63	64	62
Decade 5	76	69	69	33	64	70	63	66	63
Fish									
Anadromous Fish - Commercial Harvest - Thousand Pounds {M pounds}									
Base Year (1989) 363									
Decade 1	363	691	691	691	691	691	691	691	691
Decade 2	273	691	691	691	691	691	691	691	691
Decade 3	68	691	691	691	691	691	691	691	691
Decade 4	56	691	691	691	691	691	691	691	691
Decade 5	56	691	691	691	691	691	691	691	691
Anadromous Fish - Sport {M pounds}									
Base Year (1989) 113									
Decade 1	113	293	293	293	293	293	293	293	293
Decade 2	85	353	353	353	353	353	353	353	353
Decade 3	64	413	413	413	413	413	413	413	413
Decade 4	27	413	413	413	413	413	413	413	413
Decade 5	27	413	413	413	413	413	413	413	413
Anadromous Fish - Sport - Thousand Fish User Days {M FUDs}									
Base Year (1989) 40									
Decade 1	40	130	130	130	130	130	130	130	130
Decade 2	30	160	160	160	160	160	160	160	160
Decade 3	22	190	190	190	190	190	190	190	190
Decade 4	10	190	190	190	190	190	190	190	190
Decade 5	10	190	190	190	190	190	190	190	190

* **BENCHMARKS:**

- FLW Maximum Present Net Value (PNV) with Flow and Long-term Sustained Yield (LTSY) Constraints
- H20 Water Yield Maximization
- MKV Maximum PNV-Market Values Only
- MLV Minimum Level of Management
- MMR Minimum Management Requirements
- RGN Range Maximization
- TBD Maximize Timber Outputs-Departure
- TBR Maximize Timber Outputs
- WLN Maximum Wilderness

Table II-1
(Continued)

Activity / Resource	BENCHMARK* FLW	H2O	MKV	MLV	MMR	RGN	TBD	TBR	WLN
Fish (Continued)									
Inland Fish - Other Than T&E {M FUDs}									
Base Year (1989) 396									
Decade 1	356	374	374	374	374	374	374	374	374
Decade 2	320	374	374	374	374	374	374	374	374
Decade 3	288	390	390	390	390	390	390	390	390
Decade 4	271	404	404	404	404	404	404	404	404
Decade 5	271	406	406	406	406	406	406	406	406
Inland Fish - Other Than T&E {pounds}									
Base Year (1989) 1424									
Decade 1	1424	1557	1557	1557	1557	1557	1557	1557	1557
Decade 2	1282	1557	1557	1557	1557	1557	1557	1557	1557
Decade 3	1154	1639	1639	1639	1639	1639	1639	1639	1639
Decade 4	1083	1734	1734	1734	1734	1734	1734	1734	1734
Decade 5	1083	1734	1734	1734	1734	1734	1734	1734	1734
Range									
Grazing Potential - Thousand Animal Months {AMs}									
Base Year (1989) 12									
Decade 1	67	40	33	0	34	41	38	34	36
Decade 2	56	38	35	0	36	39	36	36	35
Decade 3	43	34	35	0	35	35	33	36	35
Decade 4	38	39	32	0	33	40	34	36	34
Decade 5	37	40	31	0	31	41	33	34	34
Recreation									
Developed Recreation - Thousand Recreation Visitor Days {M RVDs}									
Base Year (1989) 1,200									
Decade 1	1261	1261	1261	0	1261	1261	1261	1261	1261
Decade 2	1453	1453	1453	0	1453	1453	1453	1453	1453
Decade 3	1646	1646	1646	0	1646	1646	1646	1646	1646
Decade 4	1838	1838	1838	0	1838	1838	1838	1838	1838
Decade 5	2030	2030	2030	0	2030	2030	2030	2030	2030
Dispersed Recreation - Million Recreation Visitor Days {MM RVDs}									
Base Year (1989) 2.56									
Decade 1	2.76	2.76	1.46	1.46	2.76	2.76	2.76	2.76	2.76
Decade 2	3.20	3.20	1.67	1.67	3.20	3.20	3.20	3.20	3.20
Decade 3	3.70	3.70	1.89	1.89	3.70	3.70	3.70	3.70	3.70
Decade 4	4.30	4.30	2.10	2.10	4.30	4.30	4.30	4.30	4.30
Decade 5	5.00	5.00	2.32	2.32	5.00	5.00	5.00	5.00	5.00

Table II-1
(Continued)

Activity / Resource	BENCHMARK* FLW	H2O	MKV	MLV	MMR	RGN	TBD	TBR	WLN
Timber									
Timber - Million Board Feet (MMBF)									
Base Year (1989) 184									
Decade 1	610	107	122	0	134	122	165	146	131
Decade 2	519	112	128	0	134	122	140	146	131
Decade 3	441	117	135	0	137	128	119	146	137
Decade 4	375	123	141	0	143	134	125	146	144
Decade 5	319	129	148	0	145	141	132	146	145
Long Term Sustained Yield (LTSY)									
Million Cubic Feet (MMCF)	43	20.7	23.4	0	22.8	22.3	20.9	23.1	23.2
Million Board Feet (MMBF)	288	138	156	0	153	149	140	155	155
Water									
Water Yield (M Acre Feet)									
Base Year (1989) 5448									
Decade 1	6369	5671	5610	5,303	5617	5659	5655	5575	5619
Decade 2	6059	5619	5530	5,303	5535	5608	5546	5558	5527
Decade 3	5723	5520	5505	5,303	5509	5509	5469	5531	5509
Decade 4	5603	5670	5512	5,303	5495	5646	5524	5536	5503
Decade 5	5574	5689	5512	5,303	5492	5678	5501	5529	5473
Wilderness									
Wilderness (Acres)									
Base Year (1989) 498,776									
Decade 1	498,776	498,776	498,776	498,776	498,776	498,776	498,776	498,776	506,496
Decade 2	498,776	498,776	498,776	498,776	498,776	498,776	498,776	498,776	506,496
Decade 3	498,776	498,776	498,776	498,776	498,776	498,776	498,776	498,776	506,496
Decade 4	498,776	498,776	498,776	498,776	498,776	498,776	498,776	498,776	506,496
Decade 5	498,776	498,776	498,776	498,776	498,776	498,776	498,776	498,776	506,496
Wildlife									
Deer (M Animals)									
Base Year (1989) 62									
Decade 1	68	62	62	62	62	62	62	62	62
Decade 2	71	62	62	62	62	62	62	62	62
Decade 3	75	62	62	62	62	62	62	62	62
Decade 4	79	62	62	62	62	62	62	62	62
Decade 5	83	62	62	62	62	62	62	62	62

Table II-1
(Continued)

Activity / Resource	BENCHMARK* FLW	H2O	MKV	MLV	MMR	RGN	TBD	TBR	WLN
Wildlife (Continued)									
All Wildlife Species - Thousand Wildlife User Days {M WUDs}									
Base Year (1989) 584									
Decade 1	584	584	500	584	584	584	584	584	584
Decade 2	584	634	540	634	634	634	634	634	634
Decade 3	584	698	590	698	698	698	698	698	698
Decade 4	584	775	650	775	775	775	775	775	775
Decade 5	584	837	690	837	837	837	837	837	837
Threatened, Endangered and Sensitive Species									
Goshawks {Number of Pairs}									
Base Year (1989) 150									
Decade 1	0	150	150	150	150	150	150	150	150
Decade 2	0	150	150	150	150	150	150	150	150
Decade 3	0	150	150	150	150	150	150	150	150
Decade 4	0	150	150	150	150	150	150	150	150
Decade 5	0	150	150	150	150	150	150	150	150
Spotted Owls {Number of Pairs}									
Base Year (1989) 97									
Decade 1	0	170	170	170	170	170	170	170	170
Decade 2	0	180	180	180	180	180	180	180	180
Decade 3	0	190	190	190	190	190	190	190	190
Decade 4	0	200	200	200	200	200	200	200	200
Decade 5	0	210	210	210	210	210	210	210	210
Eagles/Falcons {Number of Pairs}									
Base Year (1989) 25/6									
Decade 1	0/0	32/9	32/9	32/9	32/9	32/9	32/9	32/9	32/9
Decade 2	0/0	35/14	35/14	35/14	35/14	35/14	35/14	35/14	35/14
Decade 3	0/0	35/14	35/14	35/14	35/14	35/14	35/14	35/14	35/14
Decade 4	0/0	35/14	35/14	35/14	35/14	35/14	35/14	35/14	35/14
Decade 5	0/0	35/14	35/14	35/14	35/14	35/14	35/14	35/14	35/14

Alternatives Considered and D Eliminated from Detailed Study

The National Environmental Policy Act of 1969 (NEPA) requires that agencies rigorously explore and objectively evaluate all reasonable alternatives and briefly discuss the reasons for eliminating those not developed in detail.

In addition to the 10 benchmarks described previously, 9 individual alternatives were analyzed. Out of this total, four alternatives, portraying a reasonable range of market and nonmarket outputs and activities, are described in detail later in this chapter.

Five alternatives were eliminated from detailed study for one or more of the following reasons:

1. Failure to adequately address the public issues;
2. Not reasonably attainable without changes in basic statutes and regulations of the National Forests; and
3. The outputs and effects of an alternative were similar (not significantly different) to one selected for detailed study (i.e., duplicate and redundant alternatives).

Descriptions of these five alternatives, including their themes, resource objectives, and rationale for elimination, are summarized below. Each of the alternatives was modeled in FORPLAN to determine outputs. Selected average annual outputs and potential outputs for these alternatives are shown in **Table II-2.**

Alternative CEE (Constrained Economically Efficient Alternative)

Theme. The purposes of Alternative CEE were: to portray the most economically efficient mix of allocations and schedules, subject to meeting minimum management requirements (MMRs) and minimum implementation requirements (MIRs); and to demonstrate the opportunity cost of the MIRs taken collectively. It also forms a base analyses to be used in evaluating Forest-level direction common to all alternatives. From a modeling standpoint MIRs were not measurable due to the effect of MMRs.

Resource Objectives. Under this alternative, resource goals and objectives were to maximize present net value (PNV) in the most economically efficient manner subject only to MMRs and MIRs. High market outputs are attained while amenity values and outputs are minimized.

Reasons for Elimination. This alternative was eliminated because it did not recognize additional Forest-wide direction needed to fully respond to major public issues, management concerns, and resource opportunities. For example, no restrictions on timber management apply to the Shasta and Trinity Units of the NRA and the foreground viewing areas along Interstate 5, Highway 299, and Highway 36.

Alternative CEF (Constrained Economically Efficient Alternative with Forest Constraints)

Theme. The purposes of this alternative are similar to Alternative CEE. However, this alternative analyzes the opportunities and costs of adding Forest-wide management directions which are common to all alternatives in addition to the MMRs and MIRs of Alternative CEE. Collectively, these are the minimum set of requirements which the Forests have determined to be important enough to impose on every alternative regardless of the theme in order to make them implementable on the ground.

Resource Objectives. This alternative determines the maximum level of outputs and PNV attainable for alternatives with Forest level management requirements applied. High market outputs are achieved while providing adequate protection to soils, water, and wildlife. Forest level requirements are described in detail later in this chapter.

Reasons for Elimination. This alternative was eliminated from detailed study because it was similar to Alternative RPA (1990 RPA Program Emphasis).

Alternative LBU (25 Percent Budget Reduction)

Theme. Under this alternative, the expected outputs and services that could be provided in the future were analyzed as if the current (normalized 1989) budget was reduced by 25 percent.

Resource Objectives. Resources would be managed to at least meet minimum requirements prescribed by laws, regulations, and Forest Service management direction. Most output levels would be reduced from current levels to meet the budget constraint. Activities would be concentrated on the existing roaded land base.

Reasons for Elimination. This alternative was discarded because the budget limitations would not allow an adequate response to local and national needs for wood products, recreation, and resource protection. There would be a 48 percent reduction in timber outputs compared to Alternative CUR (No Action/No Change) in the first decade.

Alternative PFD (Preferred Alternative/ Departure)

Theme. The theme of this alternative is identical to Alternative PRF (Preferred Alternative), except that departure from non-declining yield is allowed for 5 decades. The purpose of analyzing this departure alternative was to determine whether multiple-use objectives could be better met by regulating the planned sale and harvest of timber volume in a manner that deviates from the principle of non-declining yield.

Resource Objectives. Resource objectives are the same as those shown for Alternative PRF which is discussed later in this chapter.

Reasons for Elimination. When compared to Alternative PRF, PFD had a higher budget, and a lower total timber harvest with more clearcutting. Alternative PRF provides more volume, with non-declining even-flow yields, without a future reduction in timber yields. Therefore, a departure does not help maintain community stability. Also, other alternatives examined in detail exceed the first period harvest of this alternative.

Overall, multiple use objectives and public issues and concerns are better addressed in Alternative PRF.

Alternative 12C (Late Successional Forest Management)

Theme. The theme of this alternative was developed by the Scientific Panel on Late-Successional Forest Ecosystems in their report to Congress titled, "Alternatives for Management of Late Successional Forests of the Pacific Northwest", published October, 1991. Alternative 12C, as described in the report, applies a series of old growth protective measures to the Forest Plan (Alternative PRF). These measures include Old Growth Reserve areas, owl additions, green tree retention, and 180 year minimum rotations forest-wide. This theme also includes the watershed/fish emphasis designed by the Panel to maintain and restore (1) ecological functions and processes in streams; and (2) habitat of potential threatened and endangered fish species and stocks of fish.

Resource Objectives. Under this alternative, resource goals and objectives are to maximize present net value (PNV) in the most economically efficient manner subject to the constraints of the preferred Forest Plan alternative (PRF) plus the additional constraints imposed by Alternative 12C.

Reasons for Elimination. This alternative was eliminated from detailed study, because it is not responsive to local social/economic needs. The highly protective measures of 12C reduce the available land base by approximately 90,000 acres and the timber harvest by approximately 50 MMBF. This is, however, an implementable alternative and can be looked at in detail if the constraints are required in the future.

Table II-2
Alternatives Eliminated from Detailed Study

Activity / Resource	ALTERNATIVE* CEE	CEF	PFD	LBU	12C
Economics					
Present Net Value (PNV)					
MM$ - 150 years	8,777	8,761	8,229	8,154	8,079
Total Cost - Million Dollars (MM$)					
Base Year (1989) 44					
Decade 1	62	61	57	48	51
Decade 2	57	56	57	47	51
Decade 3	61	61	59	48	53
Decade 4	62	62	61	49	55
Decade 5	64	63	63	49	57
Fish					
Anadromous Fish - Commercial Harvest - Thousand Pounds (M pounds)					
Base Year (1989) 363					
Decade 1	691	691	691	691	691
Decade 2	691	691	691	691	691
Decade 3	691	691	691	691	691
Decade 4	691	691	691	691	691
Decade 5	691	691	691	691	691
Anadromous Fish - Sport (M pounds)					
Base Year (1989) 113					
Decade 1	293	293	293	293	293
Decade 2	353	353	353	353	353
Decade 3	413	413	413	413	413
Decade 4	413	413	413	413	413
Decade 5	413	413	413	413	413
Anadromous Fish - Sport - Thousand Fish User Days (M FUDs)					
Base Year (1989) 40					
Decade 1	130	130	130	130	130
Decade 2	160	160	160	160	160
Decade 3	190	190	190	190	190
Decade 4	190	190	190	190	190
Decade 5	190	190	190	190	190

* **ALTERNATIVES:**
CEE - Constrained Economically Efficient Alternative
CEF - Constrained Economically Efficient Alternative with Forest Constraints
PFD - Preferred Alternative/Departure
LBU - 25 Percent Budget Reduction
12C - Late Successional Forest Management

Table II-2
(Continued)

Activity / Resource	ALTERNATIVE* CEE	CEF	PFD	LBU	12C
Fish (Continued)					
Inland Fish - Other Than T&E (M FUDs)					
Base Year (1989) 356					
Decade 1	374	374	374	374	374
Decade 2	374	374	374	374	374
Decade 3	390	390	390	390	390
Decade 4	404	404	404	404	404
Decade 5	406	406	406	406	406
Inland Fish - Other Than T&E (M pounds)					
Base Year (1989) 1424					
Decade 1	1,551	1,557	1,557	1,557	1,557
Decade 2	1,557	1,557	1,557	1,557	1,557
Decade 3	1,639	1,639	1,639	1,639	1,639
Decade 4	1,734	1,734	1,734	1,734	1,734
Decade 5	1,734	1,734	1,734	1,734	1,734
Range					
Grazing Potential - Thousand Animal Months (M AMs)					
Base Year (1989) 12					
Decade 1	34	34	34	34	34
Decade 2	36	36	36	36	36
Decade 3	35	35	35	35	35
Decade 4	33	33	33	33	33
Decade 5	31	31	31	31	31
Recreation					
Developed Recreation - Thousand Recreation Visitor Days (M RVDs)					
Base Year (1989) 1,203					
Decade 1	1,261	1,261	1,261	1,261	1,261
Decade 2	1,453	1,453	1,453	1,453	1,453
Decade 3	1,646	1,646	1,646	1,646	1,646
Decade 4	1,838	1,838	1,838	1,838	1,838
Decade 5	2,030	2,030	2,030	2,030	2,030
Dispersed Recreation - Million Recreation Visitor Days (MM RVDs)					
Base Year (1989) 2.56					
Decade 1	2.76	2.76	2.76	2.76	2.76
Decade 2	3.20	3.20	3.20	3.20	3.20
Decade 3	3.70	3.70	3.70	3.70	3.70
Decade 4	4.30	4.30	4.30	4.30	4.30
Decade 5	5.00	5.00	5.00	5.00	5.00

Table II-2
(Continued)

Activity / Resource	ALTERNATIVE* CEE	CEF	PFD	LBU	12C
Timber					
Timber - Million Board Feet {MMBF}					
Base Year (1989) 184					
Decade 1	134	129	89	55	36
Decade 2	134	129	81	55	37
Decade 3	137	135	85	55	39
Decade 4	143	142	89	55	41
Decade 5	145	142	94	55	43
Long Term Sustained Yield {LTSY}					
Million Cubic Feet {MMCF}	22.8	22.4	16.2	11.2	10.3
Million Board Feet {MMBF}	152.0	149.4	108.1	74.7	68.7
Water					
Water Yield {M Acre Feet}					
Base Year (1989) 5303					
Decade 1	5,303	5,303	5,303	5,303	5,303
Decade 2	5,303	5,303	5,303	5,303	5,303
Decade 3	5,303	5,303	5,303	5,303	5,303
Decade 4	5,320	5,315	5,308	5,303	5,315
Decade 5	5,303	5,303	5,315	5,303	5,312
Wilderness					
Wilderness {Acres}					
Base Year (1989) 498,776					
Decade 1	498,776	498,776	498,776	498,776	498,776
Decade 2	498,776	498,776	498,776	498,776	498,776
Decade 3	498,776	498,776	498,776	498,776	498,776
Decade 4	498,776	498,776	498,776	498,776	498,776
Decade 5	498,776	498,776	498,776	498,776	498,776
Wildlife					
Deer {M Animals}					
Base Year (1989) 62					
Decade 1	62	62	62	62	62
Decade 2	62	62	62	62	62
Decade 3	62	62	62	62	62
Decade 4	62	62	62	62	62
Decade 5	62	62	62	62	62

Table II-2
(Continued)

Activity / Resource	ALTERNATIVE* CEE	CEF	PFD	LBU	12C
Wildlife (Continued)					
All Wildlife Species - Thousand Wildlife User Days {M WUDs}					
Base Year (1989) 584					
Decade 1	584	584	584	584	584
Decade 2	634	634	634	634	634
Decade 3	698	698	698	698	698
Decade 4	775	775	775	775	775
Decade 5	837	837	837	837	837
Threatened, Endangered and Sensitive Species					
Goshawks {Number of Pairs}					
Base Year (1989) 150					
Decade 1	150	150	150	150	150
Decade 2	150	150	150	150	150
Decade 3	150	150	150	150	150
Decade 4	150	150	150	150	150
Decade 5	150	150	150	150	150
Spotted Owls {Number of Pairs}					
Base Year (1989) 97					
Decade 1	170	170	170	170	185
Decade 2	180	180	180	180	195
Decade 3	190	190	190	190	210
Decade 4	200	200	200	200	210
Decade 5	210	210	210	210	210
Eagles/ Falcons{Number of Pairs}					
Base Year (1989) 25/6					
Decade 1	32/9	32/9	32/9	32/9	32/9
Decade 2	35/14	35/14	35/14	35/14	35/14
Decade 3	35/14	35/14	35/14	35/14	35/14
Decade 4	35/14	35/14	35/14	35/14	35/14
Decade 5	35/14	35/14	35/14	35/14	35/14

Alternatives Considered in Detail

E

Introduction

This section covers a variety of topics relating to the alternatives and management prescriptions: (1) it presents direction common to all alternatives; (2) it explains the concept of management prescriptions and their relationship to the management areas; (3) it describes the alternatives and shows in table format acreage allocations, outputs, and costs for each; and (4) it compares the alternatives both narratively and in tabular form. Maps for each alternative are in a packet accompanying this Draft EIS.

Direction Common To All Alternatives

Higher level direction (laws, regulations, and regional and national policy) is part of the Forests' overall management direction and as such is common to all alternatives. Higher level direction is not repeated in this document unless it is used to emphasize a particular point.

Direction common to all alternatives, which is presented in this document, includes: (a) Minimum Management Requirements; (b) Minimum Implementation Requirements; (c) Timber Policy Requirements; (d) Old-growth Legislation; (e) Regional Herbicide Policy; (f) Forest Management Requirements; and (g) Forest Standards and Guidelines.

Minimum Management Requirements (MMRs). MMRs are designed to meet basic requirements taken from the National Forest Management Act (NFMA) regulations for the management of National Forest land. They represent requirements outside Forest Service authority, because they are based on statutes and regulations rather than agency policy. Procedures for defining MMRs were specified by the Pacific Southwest Region (Region 5). MMRs apply to all alternatives and most benchmarks. MMRs include:

(1) **Suitable Lands** - Lands are considered suitable for timber production if:

(a) The land is forested and is currently producing or is capable of producing crops of industrial wood;

(b) The land has not been withdrawn from timber production by Congress, the Secretary of Agriculture, or the Chief of the Forest Service. On the Shasta-Trinity National Forests the five existing Wildernesses and the Shasta Mud Flow Research Natural Area are examples of lands withdrawn from timber production;

(c) Technology and knowledge are available to ensure timber production without irreversible damage to soils, productivity, or watershed conditions;

(d) Existing technology and knowledge, as reflected in current research and experience, provide reasonable assurance that adequate restocking can be attained within five years after final harvest; and

(e) Adequate information is available to project responses to timber management activities.

(2) **Threatened and Endangered (T&E) Species.** The habitat determined to be critical for T&E species will be identified and measures will be prescribed to prevent the destruction or adverse modification of such habitat. The peregrine falcon, northern spotted owl, marbled murrelet, and bald eagle are the only species on the Forest that fall in this category. Recovery targets assigned to the Forests for peregrine falcon are 6 pairs and for bald eagle 20 pairs. Recovery for the owl is provided by habitat set aside through a combination of the adoption of the Interagency Scientific Committee Report (ISC) and the adoption of the Fish and Wildlife Service draft recovery plan. Recovery requirements for the marbled murrelet are not yet known, but they will be incorporated into the Final Land and Resource Management Plan. No activity will occur in marbled murrelet habitat until their requirements are known.

On September 28, 1992, the U.S. Fish and Wildlife Service (USFWS) listed the marbled murrelet population in Oregon, Washington, and California as a threatened species under the Endangered Species Act (ESA). The Forest Service is now consulting with the USFWS on all activities that may affect the marbled murrelet. Based on a review of information about the effects of Forest Service management activities on the marbled murrelet, new limitations on future actions have been instituted to maintain options for a more permanent marbled murrelet conservation strategy. The Forest Service will not sign any additional decision notices for timber sales that would log existing marbled murrelet habitat on National Forest lands within 35 miles inland from the marine environment.

Future changes in management direction are expected as additional information on the marbled murrelet is gathered and analyzed. The Forest Service established a marbled murrelet conservation assessment team in June, 1992. This team will consolidate the available information concerning marbled murrelet ecology and habitat conditions in order to determine the efforts needed for maintaining healthy populations through its current range. The team's

findings are expected to be reported in October, 1993.

The USFWS is developing a recovery plan for the marbled murrelet. A draft is expected out by 1994. Region 5 will prepare multi-year, multi-phase implementation recovery strategies to help monitor and accomplish the Forest Service's portion of recovery objectives and actions agreed to in an approved USFWS recovery plan. The implementation strategies will be incorporated into the Forest Plans or support documents (Forest Service Manual [FSM] 2672.24, 2672.24a).

National Environmental Policy Act (NEPA) documents will be prepared when a more permanent policy is developed to protect the marbled murrelet. NFMA and NEPA procedures will be followed in preparing interim standards and guidelines for the marbled murrelet.

(3) **Viable Wildlife Populations.** A viable population is regarded as one that has the estimated numbers and distribution of reproductive individuals within the planning area to insure its continued existence throughout the species range. Mitigation measures were defined for viable populations in two areas: goshawks and snag-dependent species.

Goshawk. Manage goshawk habitat to maintain the known range of the species at a density of at least one territory of 100 acres per 18 square miles, with distances between adjacent territories no more than 12 miles. This results in maintaining habitat for 150 pair of goshawks, distributed in forested areas across the Forests.

Snag-Dependent Species. Within the conifer and broadleaf vegetation types provide, maintain, and manage for an average of 1.5 snags per acre with the following specifications:

a. 1.2 snags per acre between 15 and 24 inches diameter at breast height (dbh) and greater than 20 feet high; and

b. 0.3 snags per acre greater than 24 inches dbh and greater than 20 feet high.

(4) **Diversity of Plant and Animal Communities.** Diversity of plant and animal communities is achieved by providing a threshold level of vegetation types and seral stages found within the Forests. Plant and animal communities are managed so that diversity is similar to that currently existing on the Forests. Reductions in diversity are prescribed only when needed to meet the overall multiple-use objectives of an alternative. Specifically, direction is to provide and maintain at least five percent of each vegetation type/seral stage combination found in the Forests.

(5) **Riparian Areas.** Provides protection of perennial streams, streambanks, shorelines, lakes and wetlands. This includes prevention of long-term adverse changes and minimization of short term changes in water temperature, chemistry, sedimentation, and channel blockages.

Riparian MMRs are defined as: (1) areas 100 feet horizontal distance from the edge of standing bodies of water; (2) areas 100 feet horizontal distance on both sides of perennial stream channels; and (3) all wetlands. Suitable timber lands within the riparian areas are allocated to Minimal Timber Management prescriptions.

(6) **Soil and Water Productivity.** Provides for conservation of soil and water resources and prevention of significant or permanent impairment of the productivity of the land. The amount of land disturbance on sensitive watershed lands is limited in order to avoid soil loss, activation of mass land failures, and degradation of water quality through sedimentation. Existing, disturbed soil areas would be identified and treated to improve soil productivity as appropriate.

(7) **Protect Designated Wild, Scenic, and Recreation Rivers.** These rivers are managed according to guidelines contained within the National Wild and Scenic Rivers Act. Management direction is focused on the maintenance and enhancement of these rivers for their recreation and scenic values.

Minimum Implementation Requirements (MIRs). MIRs are used to ensure that alternatives are minimally acceptable and implementable on the ground. They differ from MMRs in that they are within agency control, but there is little discretionary control regarding their application at the Forest level. They are established at the Regional level and apply to all alternatives but not to the benchmarks. MIRs help ensure that:

(1)Sensitive plants are managed so that species do not become threatened or endangered because of Forest Service actions.

(2)Foregrounds and middlegrounds of State and County designated scenic highways (or those within the 1970 State Master Plan) are managed to partial retention visual quality objectives (VQOs). Affected routes are U.S. 97, State Highways 3, 36, 89, and Interstate 5 from its intersection with U.S. Highway 97 to its intersection with State Highway 89.

(3)No more than 18 percent of the total suitable timber land base is available for clearcutting under even-aged management systems in any decade.

Timber Policy Requirements. This group of requirements focuses on forest management policies such as: (1) rotation length and culmination of mean annual increment requirements for timber harvest scheduling; (2) sustained yield requirements; (3) harvest flow requirements; and (4) dispersion. Refer to Appendix B.

Old-Growth Legislation. Old growth legislation, primarily for the Pacific Northwest Region and the Klamath Province of the Pacific Southwest Region USDA-Forest Service, is pending at both the State and Federal level. On May 28, 1991 Congress chartered a committee consisting of Jack Ward Thomas, Jerry Franklin, Norm Johnson, and Jim Gordon with the charge of developing a scientifically creditable old growth management strategy for Federal lands.

On June 10, 1991 National Forests, National Parks, and Bureau of Land Management Districts within the Douglas-fir zone of the Pacific Northwest sent representatives to Portland, Oregon to assist this committee in developing its strategy. Major elements in this strategy were to include such things as critical anadromous fisheries habitat, threatened, endangered, and sensitive plant and wildlife species habitat and critical watersheds.

Old growth stands were placed into one of three categories: (1) *most significant*, (2) *significant*, and (3) *other*. *Most significant* old growth was defined as those large contiguous stands exhibiting little fragmentation. *Significant* old growth was defined as large areas containing old growth exhibiting some fragmentation. *Other* old growth was defined as highly fragmented areas with residual stands of old growth.

Seventeen alternatives have been developed and analyzed to determine the affects on other Forest resources.

If the current policy on old growth was to change to either protect all old growth stands or to significantly modify present silvicultural treatments, the timber ASQ for each alternative would decrease significantly. These changes would be projected from data supplied by the Region's computer model of vegetation management cost and yields and would be adapted to this Forests' specific situation as well as to the alternatives presented in this Draft EIS.

Regional Herbicide Policy. In February 1989, Region 5 released a Final Environmental Impact Statement (FEIS) for Vegetation Management for Reforestation. It includes detailed discussions and analyses of a preferred alternative (emphasize local management flexibility); alternatives to the preferred (including no vegetation management, no application of herbicides, and no aerial application of herbicides); and the consequences to the environment. The FEIS addresses the effects of various vegetation management treatments, including herbicide use, on issues such as water quality, human health and safety, and fish and wildlife. Project level environmental analysis would address site-specific issues.

Based on the preferred alternative in the FEIS, as modified in the Record of Decision (hereby incorporated by reference into the Shasta-Trinity National Forests' Draft EIS and proposed Forest Plan), all alternatives in the proposed Forest Plan and Draft EIS are predicated on the continued use of the full range of vegetative treatments.

The proposed Forest Plan (See Chapter 4 - Forest Standards and Guidelines for timber) directs that: (1) the selection of any treatment would be made at the project level based on a site-specific analysis of the relative effectiveness, environmental effects, and costs of the feasible alternatives. Herbicides would be selected only if their use is essential to meet management objectives; and (2) monitoring and enforcement plans to implement specific measures would be developed for site-specific projects and described in the environmental analyses for these projects.

All alternatives in this Draft EIS assume continued use of the full range of treatments for reforestation and timber stand improvement, including mechanical, biological, chemical, and thermal. The Citizens for Better Forestry (CBF) alternative does not include the use of chemical methods.

If the current policy on the use of herbicides were to change to either disallow or restrict their use, then, based on the effects outlined in the Regional Vegetation Management for Reforestation FEIS, the timber yields and vegetation management costs for each alternative presented in this Draft EIS would likely change as shown below. These changes are projected from data supplied by the Region's computer model of vegetation management costs and yields and are adapted to this Forests' specific situation as well as to the proposed Forest Plan alternatives presented in this Draft EIS.

The analysis indicates a reduction in ASQ of about 5 percent if no herbicides are used, due to the loss of conifer stocking and growth of potential crop trees. The need for alternate treatments would raise annual costs about 30 percent. There would be no change in the suitable timber land base for any alternative, because all lands are assumed to be regenerable to minimum stocking standards within five years after harvest, using methods other than herbicides.

Eliminating aerial use of herbicides would result in a reduction in ASQ of about 2 percent and raise annual costs about 5 percent.

Forest Management Requirements (FMRs). FMRs are minimum standards needed to ensure implementability at the local Forest level. They are based on Forest (rather than Regional) conditions that are in addition to MMRs and MIRs. These requirements are not applied to benchmarks or the Constrained Economic Efficiency (CEE) Alternative. FMRs are applied to all other alternatives and include the following:

(1) **Whiskeytown-Shasta-Trinity National Recreation Area (NRA).** The Shasta and Trinity Units of the NRA are common to the alternatives considered.

(2) **Sensitive Travel Corridors/Viewsheds.** The foreground areas along Interstate 5 (south of the Highway 89 junction), Highway 299, and Highway 36 (east of Highway 3) are managed to meet a minimum visual quality objective of partial retention.

(3) **Bitterbrush.** This browse species would be maintained as a component of vegetation in important deer summer range on the McCloud Flats and an area north of Mt. Shasta.

(4) **Hardwoods.** Maintain an average basal area of 30 square feet of hardwoods on major wildlife and visual areas to protect hardwood dependent species and visual quality.

(5) **Wildlife Emphasis Areas.** Some areas would emphasize decadent habitat: snags and down logs. Snags would be maintained at a density of at least 2.5 per acre. Large, down logs would be maintained at natural levels in some wildlife emphasis areas and up to 30 tons per acre in other areas.

(6) **Existing Administrative Sites and Developed Recreation Sites.** Existing sites are common to all alternatives considered.

(7) **Mt. Shasta Ski Area.** Approximately 1,690 acres are allocated to downhill skiing use in all alternatives.

(8) **Proposed Special Interest Areas (SIAs).** Eight areas are proposed for SIA consideration under all alternatives.

(9) **Proposed Research Natural Areas (RNAs).** Four areas among the 14 areas being considered for RNAs are common to all alternatives.

(10) **Riparian Areas Along Intermittent and Ephemeral Streams.** A minimum riparian management zone of 100 feet on each side is identified for protection of water quality and fisheries habitat.

Forest Standards and Guidelines (Common to All Alternatives)

More than 200 Forest-wide Standards and Guidelines (S&Gs) are detailed in Chapter 4 of the proposed Forest Plan. Management direction is presented for each of the resources, support functions, and areas of special concern on the Shasta-Trinity National Forests. The S&Gs provide the resource protection measures that would be used when implementing project activities. Used in conjunction with the management practices for each Management Prescription (described later), they provide the means to mitigate or minimize adverse resource impacts. Following is a summary of what these S&Gs include:

The number shown with each resource area (i.e., Air Quality 1a to 1d) references the S&Gs that are contained in the proposed Forest Plan.

Air Quality

Direction is contained in S&Gs 1a through 1d. The focus is on protection, maintenance, and monitoring of air quality.

Biological Diversity

Standards and Guidelines dealing with the components of diversity are covered in 2a through 2m. The general concept is dealt with in 2a and 2b. Direction for natural openings is found in 2d and 2e. Snag management S&Gs are found in 2g and 2h. Direction for management of dead/down material is located in 2i. Item 2j contains seral stage direction. Direction for hardwood management is covered in 2k and 2l. Travel corridors for wildlife species are provided in 2m.

Biomass

Forest direction is contained in S&Gs 3a and 3b. It deals with preparation and implementation of action plans for biomass utilization.

Botany (Plants)

Standards and guidelines pertaining to sensitive and endemic plants are covered in 4a through 4h. Direction is provided for mapping, recording, protecting, and monitoring essential habitat.

Chaparral

Direction is described in S&Gs 5a through 5c. Item 5a focuses on the coordinated planning of treatment projects with State and Federal agencies; 5b addresses the management of chaparral to create a mosaic of vegetative classes; and 5c outlines criteria for project selection.

Cultural Resources

A series of S&Gs (6a through 6i) provides direction for cultural resources. This direction includes: direction for "archaeological interest" resources (6a); consideration for the National Register of Historic Places (6c and 6g); identification (6d and 6e); mitigation (6g); and management of traditional Native American religious rights and practices (6h and 6i).

Facilities

Forest direction for roads and trails is found in Items 7a through 7p. Road maintenance direction is given under 7a and b. Construction and reconstruction is addressed in 7c. Road closure policies are identified in 7e and f. Criteria for retention of roads on the transportation system is provided under 7g. Trail maintenance and management is discussed under 7j, 7k, and 7l. Considering hazards when locating and designing administrative and recreation facilities is covered in 7m; 7n addresses the management, construction, and maintenance of buildings and administrative sites; inspection of dams and bridges is 7o; and monitoring of potable water sources and designated swimming areas is covered in 7p.

Fire and Fuels

Management direction includes appropriate suppression response (8a); suppression response on wildfires on State-protected private lands (8b); activity fuel treatment standards (8c and d;) natural fuel treatment priorities (8e); (8f) addresses fuelbreak construction investments; and (8g) deals with fire prevention efforts.

Fisheries

Management direction focuses on the development of an instream flow assessment program (9a); coordinating instream flow needs with State and local agencies (9b); and coordinating and improving the anadromous fishery within the South Fork Trinity River (9c and d). Additional S&Gs affecting fisheries are contained in the Range and Soils/Water Sections and under Management Prescription IX which applies to all riparian areas on the Forests, mapped or not.

Forest Pests

Standards and guidelines 10a through 10j address: the affects that Forest pests have on management objectives (10a); implementing an integrated pest management (IPM) program (10b); blister rust (10c); bark beetle attack (10d); Port-orford-cedar root disease (10e); animal damage management (10f); and dwarf mistletoe measures are discussed in 10g through 10j).

Geology

There are no Forest-wide Standards and Guidelines common to all alternatives.

Lands

Management direction is contained in S&Gs 12a through 12z. The direction covers a wide variety of lands-related items such as nonrecreational special uses (12a-c); rights-of-way acquisition (12d); withdrawals (12e); land ownership adjustments and land classification (12f to h); transportation and utility corridors (12i); occupancy trespass (12j); hydroelectric power projects (12k to w); multi-user electronic sites (12x and y); and land line location (12z).

Law Enforcement

Forest direction is contained in S&G 13 which deals with protection of the public interest.

Minerals

Direction for minerals management is shown in S&Gs 14a through 14j). Items 14a and 14b deal with restricting other forest activities and capital investments in or adjacent to areas with known mineral reserves. Forest-wide management direction also covers plans of operation (14c and 14d); geothermal and oil and gas lease applications (14e and 14f); minerals materials inventory and developments (14g and h); and mineral withdrawals (14i and 14j).

Range

Direction common to all alternatives is contained in S&Gs 15a through 15h. Maintenance of domestic livestock grazing is discussed in 15a; direction for water development is found in 15b; priorities for use of forage are identified in 15c; coordination of vegetative management practices is found in 15d; design and construction of fencing is dealt with in 15e; protection of riparian habitat is contained in 15f; development of grazing

systems and improvement of forage production is covered under 15g, and range land improvement is discussed in 15h.

Recreation

Direction is found in S&Gs 16a through 16u. It includes management under the recreation opportunity spectrum (ROS) system (16a); project plans adjacent to the PCT (16b); providing facilities for the handicapped (16c); vegetation management in developed recreation sites (16d); off-highway vehicle (OHV) management (16e and f); interpretation services for visitors (16g); general management of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) (16h); direction for recreation residences (16i); recreation opportunity guides for Ranger Districts (16j); winter recreation opportunities (16k); water-oriented recreation activities (16l); urban use of lands adjacent to National Forest lands (16m); mitigating physical impacts of dispersed recreation use (16n); outfitter/guide services (16o and 16p); promoting partnerships (16q); reducing campsite maintenance expenses (16r); encouraging private sector assistance (16s); providing environmental education services (16t); and providing interpretive association sales outlets (16u).

Riparian Areas

Riparian area direction is found in S&Gs 17a, b, and c. These items discuss identification and verification of riparian areas and maintaining their integrity. In addition, the standards and guidelines listed under Management Prescription IX (Riparian Management) (see proposed Forest Plan, Chapter 4) apply to all riparian areas in all alternatives.

Soils and Water

S&Gs associated with soils and water are covered in 18a through 18l. Management direction emphasizes cumulative impacts of management activities on stream channel condition and water quality (18a); management activities in 5th order watersheds (18b); implementation of Best Management Practices (BMPs) (18c and d); soil productivity protection (18e); watershed improvement priorities (18f); water rights for consumptive uses (18g); watershed damage potential from land management activities (18h); addressing impacts from other resource activities (18h through 18j); dust abatement (18k); and continuing ecological unit inventories (18l).

Special Areas

These are addressed by S&Gs 19a through 19g. Items 19a through 19d focus on opportunities for proposing and managing Research Natural Areas (RNAs); S&Gs 19e through 19g deal with classification, evaluation and management of Special Interest Areas (SIAs).

Timber

Forest S&Gs are contained in Items 20a through 20o. Item (20a) deals with verifying the suitability of land for timber production; harvesting of timber on lands classified as unsuitable for timber production is (20b); silvicultural treatments are found in (20c); determination of silvicultural systems (20d); regeneration harvest unit compliance (20e); priority for harvesting (20f and 20g); (20h) uneven-aged management on test areas; minimum stocking standards (20i); diversity of tree species (20j); (20k) examines opportunities to regenerate nonstocked suitable timber lands; the use of terracing (20l); range of vegetative management methods (20m); use of commercial thinning (20n); and improvement objectives (20o) are included.

Visual Quality

Visual management measures for each alternative deal with the general direction to follow in using the adopted visual quality objective (VQO) maps (21a), and with specific management direction for designated sensitive corridors and viewsheds (21b through 21d). While the direction does not vary between alternatives, the list of roads to which the direction applies under 21b through 21d does vary.

Water

See Soils and Water.

Wild and Scenic Rivers

Direction for wild and scenic rivers is contained in S&Gs 23a through 23d. Item 23a discusses development of management plans for existing rivers. Item 23b provides protection for proposed rivers. Specific direction for Wild and Scenic Rivers is contained in Management Prescription I for Wild segments, Prescription II for Scenic segments, and Prescription III for Recreation segments. S&G 23c deals with segments of the Sacramento River and (23d) provides for a Coordinated Resource Management Plan for the McCloud River corridor.

Wilderness

S&Gs 24a through l deal with: developing Wilderness plans (24a); posting wilderness boundaries (24b); completing Wilderness Fire Management Plans (24c); banning or limiting imposing bans or limits on certain uses

(24d); emphasizing wilderness-dependent uses (24e); initiating visitor information programs (24f); including search and rescue procedures in Wilderness Plans (24g); maintaining high quality water levels (h); retaining the primeval character of the wilderness environment (24i); maintaining fish and wildlife species indigenous to wildernesses (24j); addressing fish stocking in Wilderness Management Plans (24k); and allowing endemic levels of insect and disease infestations (24l).

Wildlife

Direction for the management of wildlife is contained in S&Gs 25a through g. S&G 25a deals with minimizing electrocution of raptors; 25b sets up a process for dealing with species transplants, introductions, or reintroductions; 25c addresses habitat management for neotropical migrant birds; 25d encourages development of educational material to enhance wildlife programs; 25e deals with improving distribution and availability of drinking water for wildlife; 25f addresses the management of black-tail and mule deer; and 25g deals with management of black bear.

Wildlife (Threatened, Endangered, and Sensitive Species)

S&Gs are covered in 25h through n. These standards address the maintenance, enhancement, and protection of species and their habitat.

Standards and Guidelines Specific to Alternatives

Introduction. There are several S&Gs which vary by alternative or where the number of areas to which the S&Gs apply. These S&Gs are described in this section.

Goshawks. All alternatives provide for 150 goshawk territories, however, the minimum size of the territories changes in some alternatives. Alternatives RPA and CUR protect a minimum of 100 acres per territory while alternatives PRF and CBF protect a minimum of 150 acres.

Visual Quality. The number of roads to which the Retention and Partial Retention standards apply in the foreground varies by alternative as follows:

	PRF	RPA	CUR	CBF
Retention	7	0	30	7
Partial Retention	20	6	22	20

The list of roads for Alternative PRF is shown in the Standards and Guidelines contained in Chapter 4 of the proposed Forest Plan. The list of roads for the other alternatives is documented in the Forest Planning Records.

Special Areas. The number of special areas to be recommended for classification varies by alternative. These differences are as follows:

	PRF	RPA	CUR	CBF
RNAs	9	5	8	13
SIAs	19	13	9	15

Regeneration by Clearcutting. All alternatives allow clearcutting as a silvicultural treatment except Alternative CBF.

Riparian Areas. The width of riparian management zones (RMZs) and the type of management within the zones varies by alternative as follows: All alternatives except CBF define RMZ 1 for class 1 and 2 perennial streams as the greater distance between the 100 year flood plain, extent of riparian vegetation, the inner gorge or the distance of two site trees from the edge of the channel. This would generally be 300 feet or greater. Alternative CBF requires that the RMZ never be less than 300 feet on each side. A similar relationship exists for class 3 streams although the distance is one site tree or 150 feet. There is no scheduled timber harvest within RMZ 1 for any alternative.

Management Prescriptions (and Their Relationship to the Management Areas)

A Management Prescription is an overall strategy for managing the resources of a specific area of land in order to address issues and obtain desired goals and objectives. The specific piece of land to which prescriptions are tied is the Management Area. The Forests have been divided into 22 Management Areas, and their boundaries are constant in all alternatives.

The boundaries of the Management Areas follow definite topographic features where possible and are generally consistent with Ranger District boundaries. Management Area boundaries are shown on maps in Chapter 4 of the proposed Forest Plan. Several prescriptions may be applied to different parts of each Management Area depending on land capability and alternative theme.

Management Prescription write-ups consist of a stated objective; management practices that are to be emphasized or permitted; a description of the areas where the prescription can be applied; and a list of standards and guidelines that apply to the prescription. The

Management Prescription S&Gs are in addition to the Forest-wide standards and guidelines. Eleven Management Prescriptions have been developed for use in the Forests.

Table II-3 summarizes the 11 Management Prescriptions. **Table II-4** provides a comparative display of each prescription's treatment of the Forests' resources and activities. A detailed description of each Management Prescription can be found in the proposed Forest Plan (Chapter 4) and in Appendix L (Descriptions of Management Practices).

The management practices that are emphasized or permitted with a particular prescription come from about three dozen practices developed for use on the Forests. Each practice has one or more outputs, some of which are defined within the FORPLAN model. A complete list of scheduled and nonscheduled outputs and how they were modeled is shown in Appendix B.

Associated Standards and Guidelines. Another important element of the Management Prescriptions is their associated standards and guidelines. A complete listing and more definitive descriptions of prescriptions and associated standards and guidelines are contained in Chapter 4 of the proposed Forest Plan.

Each Management Prescription, when applied to the ground, provides a set of outputs and/or effects.

Occasionally there are areas with overlapping prescriptions. Wherever this occurs, the most restrictive prescriptions, as to the type of management activities that may take place, prevail. For example, a Research Natural Area (Prescription X) may occur within a Wilderness area (Prescription V). In this situation, the most restrictive prescription, Prescription V, would apply.

The relative degree of restriction on management activities for the prescriptions used in the alternatives considered in detail is (from most restrictive to least restrictive) as follows:

V - Wilderness Management;

X - Special Area Management;

I - Unroaded Non-Motorized Recreation (Wild Segments of Wild and Scenic Rivers);

IX - Riparian Management (Class 1 and 2 Streams, etc.);

XI - Cultural Resource Management;

VII - Threatened, Endangered, and Selected Sensitive Species;

I - Unroaded Non-Motorized Recreation (including Roadless Recreation);

II - Limited Roaded Motorized Recreation (including Scenic portions of Wild and Scenic Rivers);

IX-Riparian Management (Class 3 and 4 Streams, etc.):

IV-Roaded, High Density Recreation;

III - Roaded Recreation (including Recreation portions of Wild and Scenic Rivers);

VI - Wildlife Habitat Management;

VIII - Timber Management.

The management direction system explained on the previous pages is graphically summarized in **Figure II-1**.

Figure II-1
The Management Direction System on the Shasta-Trinity National Forests

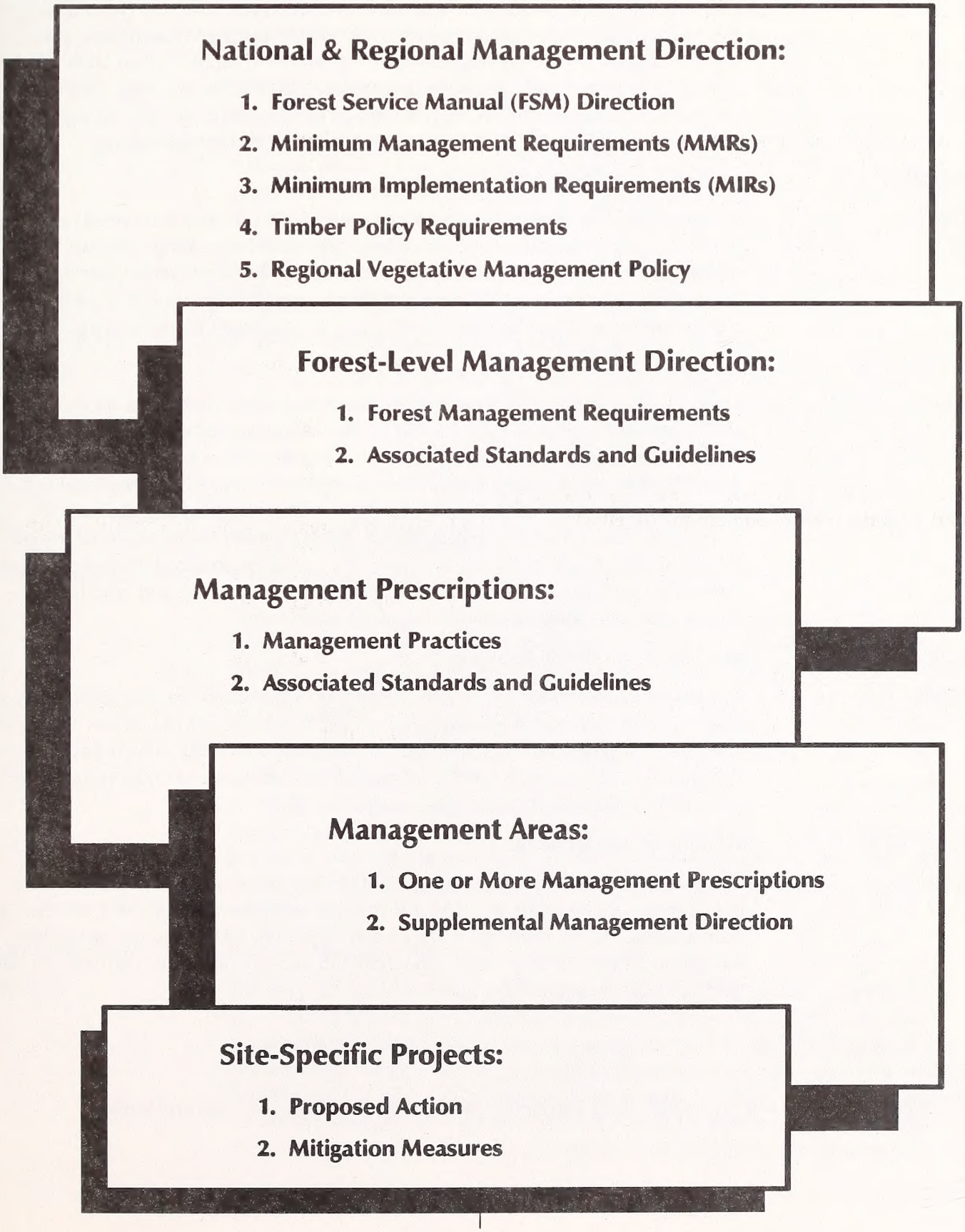


Table II-3
Summary of Management Prescriptions for the Shasta-Trinity National Forests

Prescription I:	**Unroaded Non-Motorized Recreation**
Objective:	The purpose of this prescription is to provide for semi-primitive non-motorized recreation opportunities* in unroaded areas outside existing Wildernesses while maintaining predominantly natural-appearing areas with only subtle modifications. Special recreational and visual values, fisheries, and riparian resources are emphasized. Also emphasized in this prescription is retention of old-growth vegetation and management of wildlife species requiring late seral stage conditions.
Prescription II:	**Limited Roaded Motorized Recreation**
Objective:	The purpose of this prescription is to provide for semi-primitive motorized recreation opportunities, while maintaining predominantly natural-appearing areas with some modifications. Recreational and visual resources are important values; semi-primitive activities are emphasized. Managing for old-growth vegetation and wildlife species requiring these late seral stages is also an important consideration.
Prescription III:	**Roaded Recreation**
Objective:	The purpose of this prescription is to provide for an area where there are moderate evidences of the sights and sounds of humans. Modifications are evident and may appear moderate to observers in the area but would be unnoticed or visually subordinate from sensitive travel routes. This prescription emphasizes recreational opportunities associated with developed road systems and dispersed and developed camp sites. Fish and wildlife management, which supports the recreational use of wildlife species (hunting, fishing, and viewing), is also emphasized. The emphasis of timber harvesting activities would be to meet recreation, visual, and wildlife objectives while maintaining healthy and vigorous stands.
Prescription IV:	**Roaded, High Density Recreation**
Objective:	The purpose of this prescription is to provide for areas which are characterized by a substantially modified natural environment. Sights and sounds of humans are readily evident, and the interaction between users is often moderate to high. Facilities are designed for use by a large number of people. Recreational and visual resources are important values with rural recreation emphasized.
Prescription V:	**Wilderness Management**
Objective:	This prescription provides for management of Congressionally designated Wildernesses in accordance with the National Wilderness Preservation Act of 1964 and associated regulations. Emphasis is placed on maintaining natural ecosystems. This includes retention of old-growth vegetation and management of wildlife species requiring these late seral stage conditions.

* Refer to Chapter VIII - (Glossary) for a description of recreation resource concepts and terms.

Table II-3
(Continued)

Prescription VI:	**Wildlife Habitat Management**
Objective:	The primary purpose of this prescription is to maintain and enhance big game, small game, upland game bird and non-game habitat, thereby providing adequate hunting and viewing opportunities. Habitat management for species which are primarily dependent upon early and mid-seral stages is an important consideration. While this prescription does not emphasize those wildlife species dependent on late seral stages, habitat favorable to these species would occur within this prescription. Vegetation is manipulated to meet wildlife habitat management objectives and to maintain healthy, vigorous stands using such tools as timber management and prescribed fire. Cutting unit sizes and locations, timing of stand entries, and intensity of site preparation, release, and thinning are modified to provide desirable habitat conditions through time. Roaded natural recreation opportunities would be maintained. Riparian habitat is managed under Prescription IX for riparian dependent fish and wildlife species.
Prescription VII:	**Threatened, Endangered, and Selected Sensitive Species**
Objective:	The purpose of this prescription is to provide special management for threatened and endangered (T&E) species. It also includes special, selected sensitive wildlife species which are primarily dependent on late seral stage conditions. This prescription also emphasizes retention and enhancement of sensitive plant species, old-growth vegetation, and hardwoods. Sensitive fish and wildlife species, which are dependent on riparian areas, would be managed in accordance with the standards and guidelines in Prescription IX.
Prescription VIII:	**Timber Management**
Objective:	The purpose of this prescription is to obtain an optimum timber yield of wood fiber products from productive forest lands. Timber yields are planned from suitable timber lands to meet the timber management objectives of producing maximum wood fiber and sawlog volume. Major investments would be made in road construction, fuels management, reforestation, vegetation management, and timber stand improvement. Timber stands would be managed to obtain maximum growth and yields using cultural practices which control competing vegetation (release and weeding), obtain stocking control (thinning), and minimize mortality (pest management). Rotation lengths would normally be short, ranging from 70 to 140 years and averaging about 110 years, depending on site and species. Vegetative manipulation would provide habitat for those wildlife species primarily dependent on early and mid-seral stages.
Prescription IX:	**Riparian Management**
Objective:	The purpose of this prescription is to maintain or enhance riparian areas, wildlife and fisheries habitat, and water quality by emphasizing streamside and wetland management. Multiple resource uses and activities would occur in support of, and to the extent that they do not adversely affect the maintenance of riparian area dependent resources (e.g., fish, wildlife, water quality). Fish habitats would be maintained and enhanced along with those semi-primitive non-motorized recreation opportunities associated with riparian areas. This prescription also emphasizes

Table II-3
(Continued)

Prescription IX: (continued)	retention and/or enhancement of old-growth vegetation. The retention and/or enhancement of habitat for sensitive species, such as the willow flycatcher, summer steelhead, and Trinity bristle snail, is also an important objective. This prescription also provides connective habitat for migration, dispersal, and foraging for several wildlife species.
Prescription X:	**Special Area Management**
Objective:	This prescription provides for protection and management of special interest areas (SIAs) and research natural areas (RNAs). Protection and management of associated amenity values, including unique plant, animal, and aquatic systems, would be consistent with special area objectives.
Prescription XI:	**Cultural Resource Management**
Objective:	The primary theme of this prescription is to protect designated cultural resource values, interpret significant archaeological and historical values for the public, and encourage scientific research of these selected properties. Visual resources, water quality, wildlife habitat, and vegetation would be protected.

Table II-4
Comparative Summary of Management Prescriptions

Resource/Activity	I Unroaded Non-Motorized Recreation	II Limited Roaded Motorized Recreation	III Roaded Recreation
Facilities	Roads: No new permanent roads will be constructed. Trails: Construct/maintain so that they are suitable for foot and equestrian travel.	Roads: Construct/maintain at low density. Primary service level D roads with a limited amount of service level C. Trails: Construct/maintain so that they are suitable for foot and equestrian travel; some open to motorized vehicles.	Roads: Construct/maintain in harmony with roaded natural ROS activities. Trails: Construct/maintain in harmony with roaded natural ROS activities.
Fire and Fuels	Shaded fuelbreaks allowed adjacent to high risk areas only; preattack facilities limited to safety zones and helispots; utilize low impact suppression techniques.	Provide shaded fuelbreaks where beneficial; preattack facilities limited to safety zones and helispots; favor low impact suppression tactics.	Locate preattack facilities to minimize conflicts with recreation use; fuel treatment to emphasize utilization.
Minerals	Mineral activity not affected; prospecting access could be restricted.	Mineral activity not affected; timely reclamation emphasized; in national recreation areas, no new locations are permitted and all minerals are subject to leasing procedures.	Mineral activity not affected; timely reclamation emphasized; in national recreation areas, no new locations are permitted and all minerals are subject to leasing procedures.
Range	Establish stocking and management levels needed to maintain or improve range to satisfactory condition.	Establish stocking and management levels needed to maintain or improve range to satisfactory condition.	Establish stocking and management levels needed to maintain or improve range to satisfactory condition.
Recreation: Off-highway Vehicles (OHV)	Closed to OHV use except for emergency purposes.	Open to OHV use on designated trails and areas rated suitable for OHV use. Use restricted in major recreation and wildlife areas.	Open to OHV use on designated trails and areas rated suitable for OHV use. Use restricted in major recreation and wildlife areas.
Recreation: Rec. Opportunity Spectrum (ROS)	Semi-Primitive Non-Motorized Recreation (SPNM).	Semi-Primitive Motorized Recreation (SPM).	Roaded Natural (RN).
Timber	No harvest; removal limited to dead, dying or high risk trees due to catastrophic events.	Primarily minimal management using stand maintenance or salvage; a limited amount of regeneration harvest.	Primarily modified management, uneven-aged or minimal management; no harvest in the Shasta Unit of the National Recreation Area (NRA).
Visual Quality	Management activities will meet retention (R) and partial retention (PR) as indicated on the adopted Visual Quality Objective (VQO) map.	Management activities will meet adopted VQOs of R and PR as shown on the adopted VQO map.	Meet VQOs of R, PR, or modification (M) as indicated on the adopted VQO map.
Wild & Scenic Rivers	This prescription applies to "wild" portions of a wild and scenic rivers designation.	This prescription applies to "scenic" portions of a wild and scenic rivers designation.	This prescription applies to "recreation" portions of a wild and scenic rivers designation.
Wildlife	Manage existing T&E and sensitive plants and animals and management indicator (MI) species habitats to help maintain and/or increase populations.	Manage to enhance habitats for selected MI at emphasis levels, resulting in possible population increases; manage T&E and sensitive plants and animals to maintain and/or increase populations.	Manage to enhance habitats for selected MI at emphasis levels, resulting in possible population increases; manage T&E and sensitive plants and animals to maintain and/or increase populations.

Table II-4
(Continued)

Resource/Activity	IV Roaded, High Density Recreation	V Wilderness Management	VI Wildlife Habitat Management
Facilities	Roads: Construct/maintain for accessing recreation areas and activities. Trails: Construct and maintain to serve as short links to primary transportation facilities.	Roads: No roads allowed Trails: Construct/maintain trails to serve primitive theme.	Roads: Manage use and density to provide for wildlife needs. Trails: Manage use to provide for wildlife needs.
Fire and Fuels	Control wildfires at smallest possible size; fuel treatment to emphasize utilization.	Locate incident bases and staging areas outside wilderness; use low impact suppression techniques and utilize natural barriers.	Fuel treatment to be determined in project analysis; leave sufficient dead/down material to meet wildlife needs.
Minerals	Mineral activity not affected; timely reclamation emphasized.	Locatable mineral activity prohibited subject to valid existing rights; mineral material and leasable mineral development prohibited.	Mineral activity not affected.
Range	Herd and/or fence to keep livestock out of recreation sites as needed.	Grazing will continue, when establishment pre-dated the wilderness, at a level consistent with the maintenance of wilderness characteristics.	Establish proper use standards for livestock consistent with wildlife needs; give preference to wildlife in major conflict areas.
Recreation: Off-Highway Vehicles (OHV)	Open to OHV use on designated trails and areas rated suitable for OHV use. Use restricted in major recreation and wildlife areas.	Closed to OHV use, except for emergency purposes.	Open to OHV use on designated trails and areas rated suitable for OHV use. Use restricted in major recreation and wildlife areas.
Recreation: Rec. Opportunity Spectrum (ROS)	Rural (R)	Primitive (P); SPNM	Roaded Natural (RN)
Timber	No harvest; removal limited to dead, dying or high risk trees.	No harvest.	Primarily modified management, uneven-aged and/or minimal management.
Visual Quality	Management activities around developed recreation sites will meet retention (R) and partial retention (PR) as indicated on the adopted Visual Quality Objective (VQO) map.	Management activities will meet preservation (P) VQOs.	Management activities will meet R, PR, or modification (M) as shown on the VQO map.
Wild & Scenic Rivers	Not applicable.	Applies to wild and scenic rivers if located within wilderness.	Not applicable.
Wildlife	Manage existing management indicator (MI) species habitats to provide for species which are tolerable to high human activity or disturbance factors.	Allow animal and plant populations to cycle naturally with little active management by humans.	Manage to enhance habitats for selected MI at emphasis levels, resulting in possible population increases; manage T&E and sensitive plants and animals to maintain and/or increase populations.

Table II-4
(Continued)

Resource/Activity	VII Threatened, Endangered and Selected Sensitive Species	VIII Timber Management	IX Riparian Management
Facilities	Roads: Limit road use and density within wildlife habitats. Trails: Limit use where conflicts with wildlife occur.	Roads: Construct/maintain a road system to efficiently access timber areas. Trails: Construct/maintain to meet Roaded Natural (RN) or Rural (R) ROS.	Roads: Restrictions on location of stream crossings and density. Trails: Same as roads.
Fire and Fuels	Fuel treatment to be determined in project analysis; meeting wildlife needs has priority.	Fuel treatment wil be managed to enhance timber and energy production while meeting watershed and wildlife needs.	Treat fuels causing watercourse damage; use low impact suppression techniques and minimize mechanical disturbance; no broadcast burning.
Minerals	Mineral activity restricted within T&E areas; not affected by sensitive species.	Mineral activity not affected.	Mineral activity not affected; timely reclamation required.
Range	Manage livestock number and use to prevent any adverse impacts to T&E and sensitive species habitat and any adverse disturbance to existing populations.	Seek opportunities to use livestock as a tool on transitional range to reduce competition for tree species; emphasize forage production for livestock and wildlife on unsuitable timber lands.	Manage livestock to prevent significant adverse impacts to riparian habitat; wildlife use has priority over livestock use where conflicts exist.
Recreation: Off-Highway Vehicles (OHV)	Open to OHV use on designated trails and areas rated suitable for OHV use. Use restricted in major recreation and wildlife areas.	Open to OHV use on designated trails and areas rated suitable for OHV use. Use restricted in major recreation and wildlife areas.	Open to OHV use on designated trails and areas rated suitable for OHV use. Use restricted in major recreation and wildlife areas.
Recreation: Rec. Opportunity Spectrum (ROS)	SPM; RN subject to wildlife habitat needs.	R and RN.	SPNM; SPM; RN; R subject to riparian area management requirements.
Timber	Timber harvest subject to needs of species based on approved recovery or management plans.	Timber management emphasized; all timber practices are allowed subject to standards and guidelines.	Timber harvest minimal to meet riparian standards; timber practices only allowed if necessary for maintenance and/or improvement of riparian values.
Visual Quality	Manage to meet R and PR as indicated on the adopted VQO map.	Management activities will usually meet a VQO of M and maximum modification (MM) with some areas meeting PR as shown on the adopted VQO map.	Management activities will meet VQOs of R and PR as shown on the adopted VQO map.
Wild & Scenic Rivers	Applies to wild and scenic river corridors where T&E or sensitive species habitat occurs.	Not applicable.	This prescription applies to riparian areas within wild and scenic river corridors.
Wildlife	Manage T&E species to achieve recovery goals; manage sensitive species to prevent listing.	Maintain habitats for viable populations of management indicator (MI) species and sensitive species with emphasis on early seral stage species.	Manage to maintain or enhance riparian habitats for MI that are totally dependent on or significantly utilize these areas.

Table II-4
(Continued)

Resource/Activity	X Special Area Management	XI Cultural Resource Management
Facilities	Roads: No new road construction allowed. Trails: Limited to meeting area objectives.	Roads: No new roads will be constructed; reconstruction allowed only if no significant adverse impacts are created. Trails: No new trails constructed.
Fire and Fuels	Not allowed except for research purposes in Research Natural Areas (RNAs); within Special Interest Areas (SIAs) utilize suppression tactics that use the least possible impacts to SIA values.	Utilize suppression tactics that cause the least possible impacts to cultural resource values.
Minerals	Locatable mineral development prohibited upon area withdrawn from mineral entry, subject to valid existing rights; mineral material and leasable mineral development prohibited.	Mineral activity subject to cultural resource requirements; extensive mitigation could be required.
Range	Livestock grazing may take place if it does not conflict with the primary intent of the RNA or SIA.	Prevent damage to sites from livestock by utilizing fencing or other restrictive practices.
Recreation: Off-Highway Vehicles (OHV)	Open to OHV use on existing designated roads only. Closed to OHV use where there are no existing roads.	Closed to OHV use.
Recreation: Rec. Opportunity Spectrum (ROS)	SPNM.	SPNM; SPM; RN.
Timber	No harvest.	No harvest.
Visual Quality	Management activities will meet VQOs of P as shown on the adopted VQO map.	Management activities will meet a VQO range consistent with cultural site purpose, ranging from R to MM.
Wild & Scenic Rivers	Not applicable.	Not applicable.
Wildlife	Protect (but do not actively manage) the habitats for existing wildlife species.	Manage habitats for viable populations of species occurring in the area.

Individual Alternative Descriptions

Each alternative is summarized below, beginning with the Preferred Alternative (PRF), followed by the 1990 RPA Program Emphasis Alternative (RPA), the No Action/No Change Alternative (CUR), and the Citizens for Better Forestry Alternative (CBF). Each is summarized in terms of:

a. The theme and resource objectives of the alternative;

b. Environments to be created or retained as a result of implementing the management direction;

c. The number of acres devoted to each management prescription; and

d. Outputs and costs. Outputs are planned for decade 1; potential outputs are shown for decades 2 through 5 for long-term comparisons and disclosure of environmental consequences.

Specific outputs for each resource are compared by alternative in **Table II-16.**

Further details on the impacts and interactions of activities and outputs are found in Chapter IV, Environmental Consequences. Finally, Appendix B discloses how each alternative was modeled during the analysis process.

Alternative PRF (Preferred Alternative)

Theme. The goal of Alternative PRF would be to propose a combination of commodity and amenity outputs, goods, and services in response to balancing national goals with local needs.

This alternative would provide a wide range of developed and dispersed recreation opportunities in a variety of settings. Special resource management emphasis would be given to riparian areas, wild and scenic rivers, and Mt. Shasta. Grazing would be maintained at current levels while fisheries would receive increased emphasis.

This alternative would provide timber outputs at about one-third of historic levels due to an increased emphasis on other resource values including set-a-sides established to protect the northern spotted owl.

On the land available for timber harvest, timber outputs would be provided from the more productive lands while maintaining natural appearing landscapes in high use recreation areas and along major travel routes. Protection and maintenance of habitat for wildlife species that are dependent on early and late seral stages are important considerations.

Refer to **Table II-6** for outputs in this alternative.

Resource Objectives

Air Quality

Emphasis would be to manage for utilization of logging residue to reduce the amount of prescribed burning for site preparation. Where burning is required to meet management objectives, it would be done only on approved burn days.

Biological Diversity

Allocations would have the effect of emphasizing later seral stage vegetation. All seral stages would remain within the five percent requirement. Chaparral would cycle naturally with the use of fire (see the Fire and Fuels section). Through fire/ecosystem research, begin to return fire to its natural role as a major component of biological diversity. See the Wildlife section for more details on biological diversity.

In Alternative PRF over 1,400,000 acres of vegetated lands would be allowed to "cycle naturally". This is defined as continuing through the processes of succession without major induced management by humans. Natural processes would occur such as insects, disease, flood, fire, windthrow, etc. Some management by humans, such as fish/wildlife habitat improvement projects would be allowed to occur. The potential estimated effects of "cycling naturally" for a 50 to 150 year period (very short ecological timeframe) would include but not be limited to:

- Loss of human-induced early seral stage areas;
- tending stands to move towards climax conditions (older seral stages);
- accumulation of dead standing/down materials;
- loss of existing human-induced fragmentation (clearcuts, roads);
- more homogeneous stands;
- reduction in total numbers of some plant/animal species (early seral stages) with increases in others (moderate to older stages);

- an increase in the area occupied by climax species;
- initial increase of shrub/hardwood species in some areas;
- reduction of shrub/hardwood species in closed canopy situations;
- occurrence of natural fire with some induced fire suppression by humans; and
- reduction in active road systems.

Biomass

Logging residues, available for biomass utilization, would be generated on approximately 5,900 acres per year in the 1st decade. Smaller material would also be generated from precommercial thinning activities on about 2,600 acres per year.

Biomass would be available for personal use firewood, energy-producing wood-burning plants, and other appropriate uses. Material would be left in sufficient quantities to provide adequate wildlife habitat and to maintain soil productivity. Excess quantities of biomass would be reduced in conjunction with treatment methods including controlled fire.

Botany

There are no Federally designated threatened or endangered plant species on the Forests.

Sensitive. Alternative PRF would emphasize maintenance of viable populations of all native plant species. Management practices would ensure that no species become threatened or endangered because of Forest Service activities.

Sensitive plant populations would be mapped and recorded. Selected populations would be monitored, and a Species Management Guide would be developed for each species.

Until these guides are developed viability would be maintained by managing habitat to perpetuate the species. In most cases this would involve protecting populations from disturbance. There are instances, however, where disturbance may be necessary to maintain viability of certain sensitive plant species. Land acquisition, special area designations, and cooperative management plans would be used as protection tools.

Forest Endemics. Populations of endemic plants would be mapped and their habitats protected, where feasible, until Forest Endemic Management Guides are developed.

Population information for sensitive and Forest endemic plants would be shared regularly with the California Natural Diversity Data Base and other appropriate agencies.

Cultural Resources

Cultural resource management activities would include increased evaluation of sites to determine resource values so that appropriate management direction could be determined. Areas subject to ground-disturbing activities would be inventoried. Identified historic properties would be evaluated before undertakings would commence. Eligible cultural resources would be nominated to the National Register of Historic Places. Inventory work in support of other resources (e.g., timber) would diminish from the level of recent years since re-entry of previously surveyed areas (e.g., timber compartments) would occur. Surveys associated with ecological unit inventories would increase.

In response to new direction in the Cultural Resources Program, increased interpretation and enhancement of Prescription XI (Cultural Resource Management) areas would take place. Monitoring activities would increase. Access, use, and integrity of traditional sites and locations important to Native American religious and cultural practices would be emphasized. Public participation (e.g., through partnerships, Passport In Time projects, etc.) would be encouraged.

Facilities

Structures. The administrative site facilities at the Northern California Service Center (NCSC), Hyampom, Big Bend, Hayfork, Weaverville, McCloud, Harrison Gulch, and Lake Shore would be upgraded.

In the interest of cost effectiveness, administrative site leases would be eliminated in favor of agency-owned facilities. A possible exception may be the public information contact site at the south (northbound) arrival station for the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA).

Recreation facilities would receive heavy maintenance and some would be upgraded to handle present-day recreation vehicles and to better serve users. Some fire lookouts would be replaced or upgraded because of their extremely poor condition.

All facilities would be operated in a reasonably safe and efficient manner. This may require construction, reconstruction and/or obliteration of some buildings or systems.

Bridge construction and replacement would stress permanent bridges on arterial and collector roads and local roads which are open to the public.

Transportation. The arterial/collector/local road system would be increased and reconstructed as shown in in **Table II-6**. No significant changes in classification or jurisdiction would be planned. Seasonal road closures would be recommended to prevent damage to roadway facilities and adjacent resources such as sensitive wildlife areas and highly erosive soils. These closures would take place as needed to meet the Forest standards and guidelines. The road and trail system would be evaluated for compliance with the Riparian standards and guidelines (see Management Prescription IX, in Chapter 4 of the proposed Forest Plan.).

Operation and maintenance of the Forests' transportation system would be similar to present standards. No major changes in construction or reconstruction standards would be anticipated. Upgrading of selected important arterial/collectors would be emphasized to increase safety and reduce maintenance and haul costs including provisions to better accommodate passenger cars.

Special emphasis would be given to creating scenic byways to accommodate the needs of those driving for pleasure. Some scenic byways may be created in cooperation with neighboring Forests, the State, Counties, and cost share cooperators.

New trail construction would remain low, but a trail or system of trails would be developed on Mt. Shasta.

Maintenance of the Forests' trail system would continue to emphasize logging out for access, prevention of resource damage, and safety of the users.

Fewer cost-share agreement supplements would be processed, since most of the large private land parcels have been accessed.

Fire and Fuels

Fire suppression would be at the most efficient level as determined by the National Fire Management Analysis System (NFMAS).

Acres burned are expected to be greater than historical averages due to the higher fuel loading across the Forests as a result of other resource needs. This would be due primarily to the allocation of approximately 500,000 acres to Prescription VII (Threatened, Endangered, and Selected Sensitive Species) which allows minimal vegetation management and associated fuel treatments and/or the treatment of natural fuels as they occur.

Treatment of natural fuels and resource activity-created fuels is projected to be approximately 6,480 acres annually in the short term. Fuels from timber harvesting would be decreased due to a decrease in overall harvesting on the Shasta-Trinity National Forests. In the long term, treatment of fuels occurring in the ecosystem would increase due to insect infestations, drought, blowdown (due to natural causes), and unnatural vegetation accumulation due to fire exclusion. By 1998, it is anticipated that the fuels treatment program would expand to 10,000 acres annually. Much of the fuels treatment would be conducted in conjunction with other functional projects, such as wildlife and ecosystem management projects. Many of the acres treated would be accomplished by methods other than burning (mechanical treatments).

In conjunction with research, a program would begin during this planning period to restore fire to its natural role in the ecosystem. The objective would be to institute prescribed natural fire on all areas burned during the last decade. In addition, all areas that have had mechanical fuel reduction, wildernesses and some areas where prescribed fire can be used to restore the natural ecosystem without prior treatment would be included.

Protection efforts would be emphasized in high value plantation areas. Flammability reduction would be utilized to help protect plantations. Within the Wildernesses the use of planned and unplanned ignitions for prescribed fire would be utilized. The anticipated burn characteristics would approximate those of pristine or near pristine conditions. Mosaic patterns for wildlife species diversity would be stressed. Wildfire suppression tactics and strategies would utilize "light hand on the land" as found in National Interagency Fire Line Handbook Forest Service Handbook (FSH) 5109.32a.

Fisheries

Habitat typing surveys and evaluations would be completed on selected anadromous fish streams, on selected redband trout streams with 50 percent or more adjacent National Forest land ownership, on most Class 1 and 2 major perennials, and on a few Class 3 minor inland fish streams.

Streamside riparian inventories would be completed on most Class 1 anadromous fish streams.

An increased reliance would be placed on the natural long-term recovery of non-sensitive and sensitive anadromous fish habitat.

Habitat improvement would occur for anadromous fish in the Trinity River Basin, warmwater fish at Shasta and Trinity Lakes and inland coldwater fish on major perennial inland fish streams. Surveys would be undertaken to analyze the need to implement habitat improvement on minor perennial inland fish streams. Direct fish habitat improvements would occur for rainbow trout and winter-run steelhead to accommodate a greater portion of major consumptive sportfishing.

Forest Pests

Maintaining and improving forest health is a guiding objective. This alternative would allow and require that consideration of a full range of pest management measures be integrated into resource management planning and activities. Detection, evaluation, and control of pest-caused damage would be intensively practiced over those lands where vegetation would be actively managed. This is particularly true where vegetation management is practiced in order to meet timber, wildlife, recreation, or other resource objectives.

Minerals

The orderly development of mineral resources would be encouraged. Any adverse impacts of mineral related activities would be minimized through required lease stipulations and the administration of plans of operation. Plans of operation would require reclamation of lands disturbed by mining.

Range

Overall, livestock grazing would be the same as current levels. Grazing use would be reduced within the transitory range in Habitat Conservation Areas. Opportunities for improved range management, particularly in riparian areas, would increase over the present level. Grazing use would be managed so that riparian habitats are maintained or improved. Water sources would be developed to meet domestic livestock needs.

Recreation

The recreation potential of the Shasta-Trinity National Forests is displayed in 12 geographic "recreation theme areas". These areas represent the framework for developing management opportunties over the next 5 decades. They respond directly to projected recreation demand increases identified in the 1989 USDA Forest Service RPA Assessment. The objective is to identify and develop unique recreation opportunities offered by each theme area, rather than to provide identical opportunities in all locations.

Theme areas would be emphasized in decades 1 and 2; they would be maintained through decades 3, 4 and 5. Descriptions of these theme areas can be found in the Recreation Section of Chapter III.

All developed recreation sites would be operated at the standard service level by the end of the 1st decade. Assistance from recreation service partners and volunteer organizations would be required to achieve standard service levels. Substandard campgrounds would be rehabilitated at the rate of 6,750 PAOT (people-at-one-time capacity) per decade (135 camping units per year). Picnic sites would be rehabilitated at the rate of 500 PAOT per decade (10 picnic units per year). Interpretive sites would be rehabilitated at the rate of 500 PAOT per decade (five interpretive sites per year). Trailheads would be rehabilitated at the rate of 1,000 PAOT per decade (two trailheads per year).

Trails would be maintained at the standard service level by the end of the 1st decade. Trails would be reconstructed at the rate of 50 miles per decade (five miles per year). Trails on the Trinity side of the Forests would have priority for reconstruction efforts. Forest personnel would recruit assistance from volunteers and organizations to leverage Forest Service trail budgets.

New recreation construction would address facility needs within the recreation theme areas. Campgrounds would be constructed at the rate of 500 PAOT per decade (two 50 unit campgrounds per decade). Picnic sites would be constructed at the rate of 500 PAOT per decade (ten 10 unit picnic sites per decade). Interpretive sites would be constructed at the rate of 300 PAOT per decade (30 interpretive sites per decade). Visitor information stations would be constructed at the rate of 50 PAOT per decade (one station per decade). Visitor information centers would be constructed to provide an additional 400 PAOT (two centers constructed in the 1st decade only). New trailheads would be constructed at a rate of 500 PAOT per decade (one trailhead per year).

New trail construction emphasis would be in the recreation theme areas. These trails would be constructed at the rate of 50 miles per decade (five miles per year). Newly constructed trails would replace old, substandard trails. In the first 50 years, this would result in 250 miles of new trail.

Wildernesses would be operated at the standard service level by the end of the 1st decade. Emphasis would be to protect and preserve the wilderness quality while maintaining its availability for use and enjoyment.

Forest off-highway vehicle (OHV) trails and low-standard roads would serve as part of a statewide system and provide long-distance touring opportunities.

Riparian Areas

Maintenance and improvement of riparian resources would be emphasized. Practices to protect stream courses and riparian resources are included in the riparian prescription standards and guidelines which vary in width. They average 350 feet on both sides of Class 1 and 2 streams and 150 feet on both sides of Class 3 and 4 streams. Timber management and other ground disturbing activities would not be permitted adjacent to Class 1 and 2 streams; they would be modified along Class 3 and 4 streams. Riparian areas would also serve as travel corridors for wildlife.

Soils

Soils would be managed to maintain or improve soil productivity and to prevent excessive surface erosion, mass wasting, soil compaction, and cumulative watershed impacts. A sufficient amount of woody debris and slash would be left after management activities to provide soil protection and organic material. Management activities within unstable areas, such as active landslides and inner gorges, would be restricted. Areas with highly erosive soils would be closed to OHV use.

Special Areas

Research Natural Areas (RNA). This alternative would allocate 24,760 acres of National Forest lands to RNAs. Under this alternative, 9 areas would be proposed for immediate establishment. See **Table IV-8** in Chapter IV for a listing of these areas.

The Pacific Southwest Research Natural Area Committee's refined target system would be used to guide the future selection of RNA candidates. Information from the California Natural Diversity Data Base would be used to assist in locating suitable examples of the target elements.

A management plan would be written for each RNA.

Special Interest Areas (SIA). Nineteen areas, totalling 6,981 acres, would be recommended for SIA designation. Twenty-two additional areas would be evaluated for their potential SIA classification. (Refer to **Table III-14** and the SIA section in Chapter III for a listing of these areas.)

Sites in the California Department of Fish and Game (DFG) inventory of significant natural areas would be considered for SIA candidate status.

A management plan would be developed for each SIA.

Timber

Timber management activities would be conducted to achieve a wide variety of resource objectives. This alternative would result in an average annual allowable sale quantity (ASQ) of 87 million board feet (MMBF) in the 1st decade from a suitable timber land base of about 575,300 acres (42 MMBF from the Shasta Forest and 45 MMBF from the Trinity Forest).

On approximately 473,000 acres suitable for timber production, timber management activities would be relatively intensive and yields would be high to moderate. In specially designated areas, timber management would be modified to attain other resource objectives, such as maintenance of visual quality and/or wildlife habitat. On about 102,300 suitable acres timber management would be minimal in order to emphasize other resource uses, such as semi-primitive recreation, or because of site limitations which preclude intensive timber management.

Approximately 502,500 suitable acres would not be available for timber management in this alternative due to land allocations to other non-timber uses which preclude timber harvesting on a regular basis.

A mix of silvicultural systems would be used to meet management objectives with an emphasis on even-aged systems. An estimation of the average annual acres and volume harvested in the 1st decade, by cutting method, is shown on **Table II-5.**

The timber on suitable lands would be managed on an average 120 year rotation (minimum 90 years). This timber harvest schedule would result in about 10.3 percent of the suitable acres being treated in the 1st decade. About 7.6 percent of the suitable acres would be regenerated in the 1st decade in this alternative.

Even-aged management would be the primary regeneration system used on lands where timber is intensively managed. Units would generally be 5 to 20 acres, and average about 10 to 12 acres in size. Reserve trees would be retained within regeneration units whenever feasible, including salvable sub-merchantable conifers and large green trees. Clearcutting would be used only when it is the only alternative to meet land management objectives. Clearcutting would be used primarily on understocked stands on steep slopes.

A mix of even-aged and uneven-aged systems, with an emphasis on selection cutting, would be used on lands where timber management is modified for other resource objectives primarily in areas managed for wildlife or visuals.

Stand maintenance, or salvage, would be the primary system used on lands where timber management is minimal.

Emphasis would be on regeneration cutting of understocked stands and stands which are growing poorly. Regeneration cutting would result in an average of 4,600 acres of reforestation per year in the 1st decade. A combination of artificial and natural regeneration would be used to regenerate the Forests. Reforestation would be done using a species mix native to the Forests.

The timber harvest schedule for this alternative would result in an average annual net growth of about 164 MMBF on suitable lands by the 5th decade. This growth represents an average of about 285 board feet per acre per year on suitable lands.

Release of conifer seedlings (chemical and non-chemical) from competing vegetation would occur on approximately 4,000 acres per year, primarily on lands where timber growth and yield is emphasized.

On suitable timber lands, hardwoods would be managed to provide a continuous supply of firewood and biomass, while providing for wildlife habitat needs. Pure hardwood stands would not be artifically converted to conifers for timber production purposes.

Visual Quality

Scenic quality would be emphasized along candidate state scenic highways, in the National Recreation Area, on Mt. Shasta, around developed recreation sites, and in major dispersed recreation areas. Visual quality would also be emphasized in the foreground of other sensitive travel corridors. An expanded wild and scenic rivers system and several new special interest areas would be managed in the foreground to provide protection for scenic quality. Wildernesses would be managed to preserve the characteristic landscape. Moderate protection would be provided for the scenic setting of waterways.

In the remainder of the Forests management activities would be noticeable on the landscape. Roads and vegetative openings would be out of scale with the characteristic landscape. Openings would be compatible with natural shapes.

This alternative would provide a high degree of emphasis on visual quality. This is because a small portion of the land base area would be allocated to emphasizing wood fiber production and the larger area set-aside for threatened and endangered species, wilderness, etc.

Water

The primary emphasis would be to maintain or improve water quality and quantity in order to meet domestic use needs and fish habitat requirements. The primary objective would be to maintain the quality of water at or above State objectives. This would be accomplished through implementation of supplemental management direction for appropriate management areas (refer to the proposed Forest Plan), and through the use of Best Management Practices (BMPs). (See the Riparian Areas section for a discussion of Riparian Management Zones.)

Degraded watersheds would be improved at the rate of about 300 acres per year. No specific management objective would be planned for the purpose of changing water yield.

Wild and Scenic Rivers

This alternative would include 106.4 miles (National Forest land only) of existing Wild, Scenic, and Recreation Rivers including New River, the North Fork Trinity River, the South Fork Trinity River, and the mainstem Trinity River. An additional 62.2 miles (National Forest land only)

Table II-5
Timber Cutting Methods (Alternative PRF)

	Acreage		Volume	
Cutting Method	Acres	Percent	MMBF	Percent
Clearcut	300	5	5	6
Green Tree Retention*	2,360	40	38	43
Selection	1,760	30	36	41
Commercial Thinning	550	9	4	5
Salvage	930	16	4	5
Totals	**5,900**	**100**	**87**	**100**

* Includes Shelterwood cuts.

of study rivers would be recommended for designation (Beegum Creek, Hayfork Creek, the upper segments of the North Fork and South Fork Trinity River, and Virgin Creek). Complete descriptions of these rivers are presented in Appendix E.

Characteristics which make the Lower McCloud River, Upper McCloud River, and Squaw Valley Creek eligible for wild and scenic river classification would be retained through development of a Coordinated Resource Management Plan with the private landowners along the river. (See Appendix N of the proposed Forest Plan).

Wilderness and Roadless Areas

Existing Wildernesses would be maintained under this alternative. Included would be the Yolla Bolly-Middle Eel Wilderness with 36,805 acres (Shasta-Trinity National Forests' portion only) as well as the Wildernesses designated in the 1984 California Wilderness Act. Acreage shown is National Forest land only.

Wilderness	Acres
Castle Crags	10,483
Chanchelulla	7,800
Mt. Shasta	38,560
Trinity Alps	405,128

A total of 498,776 acres on the Shasta-Trinity National Forests would be managed as part of the National Wilderness Preservation System.

Approximately 81 percent of the 29 released roadless area's acreage would remain undeveloped. This is because much of the later seral stage vegetation exists in these roadless areas; it was allocated as habitat for older seral stage dependent species (spotted owl).

The Mt. Eddy Further Planning Area (7,720 acres) would be managed primarily for semi-primitive non-motorized and semi-primitive motorized recreation.

Wildlife

Wildlife management objectives would maintain habitat to support all species on the Forests at or above viable population levels. The distribution and variety of wildlife habitat would be maintained.

Management indicators, or wildlife assemblages, would be managed to benefit all species that are represented by the assemblage. Forest standards and guidelines pertaining to special habitat components (i.e., snags, hardwoods, dead and down material, seral stages, etc.) would set the minimum level of management throughout the Forests.

Hardwood forest types would be managed primarily for the benefit of wildlife and not for conversion to conifers.

In the 1st decade, the average direct habitat improvement would be done annually on 5,050 acres.

About 214,962 acres would be allocated to Prescription VI (Wildlife Management) in this alternative. Included in this prescription are deer winter ranges and 5,000 to 6,000 acres of bitterbrush. Timber management activities would benefit wildlife. This prescription provides an average of at least 30 square feet of basal area per acre in hardwoods, and minimizes disturbances to wildlife that may take place through use of the Forests' transportation network.

Wildlife - Threatened, Endangered (T&E), and Sensitive Species

All known or future sites of Federally listed threatened or endangered (T&E) species or Regional Forester identified sensitive species would be fully protected and managed according to the recovery plan and/or habitat requirements for each species.

Environment to be Created

By the year 2040, about 75 percent of the Forests would remain in a fairly natural condition. This percentage would be in relatively large, contiguous blocks including five wildernesses, nine research natural areas, seven wild and scenic rivers, and Spotted Owl Habitat (HCAs and CHAs).

Areas managed for their riparian values would also contribute to a naturally appearing landscape, particularly along perennial streams. Large portions of the 29 former roadless areas would remain unroaded.

Areas seen from State highways, county roads, forest roads with high recreation use, and recreation sites would remain relatively unchanged. Forest activities would not be evident in areas with distinctive landscapes.

On the remaining 25 percent of the Forests, forest management activities would be evident. These areas would be modified to varying degrees by activities such as timber harvesting, road construction, developed recreation areas, and mining. Openings created by timber cutting would be apparent but well dispersed throughout the area.

In 50 years, about 10 percent of the Forests would consist of stands which are less than 50 years of age. These regenerated stands would generally consist of larger even-aged stands (greater than 5 acres) on about 6 percent of the Forests. Smaller even-aged and uneven-aged stands would be normal on the remaining 4 percent of the Forests where timber activities occur.

Wildlife habitat would be less diverse than it is today, with more habitat in the late seral stages and less habitat in the early seral stages.

The number of acres allocated to each Management Prescription under Alternative PRF follows:

Table II-6
Average Annual Outputs by Decade - Alternative PRF*

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Economics							
Total Budget (MM$)	40	-	43.2	44.4	45.9	47.2	49.7
Total Cost (MM$)	44	-	56.8	58.1	59.6	60.9	63.3
Facilities							
Transportation							
Trail Construction/Reconstruction (miles)	0/1	-	5/5	5/5	5/5	5/5	5/5
Road Construction (miles)	63	-	22	11	10	5	5
Road Reconstruction (miles)	73	-	22	22	20	20	21
Road Maintenance (miles)	6,500	-	6,570	6,680	6,780	6,830	6,880
Dams and Reservoirs (number)							
Forest Service	2	-	2	2	2	2	2
Other Federal	3	-	3	3	3	3	3
Other State/Local	1	-	1	1	1	1	1
Private	10	-	10	10	10	10	10
Administrative Sites (number)							
Forest Service Owned	24	-	26	26	26	26	26
Leased	2	-	0	0	0	0	0
Fire and Fuels							
Total Fuel Treatment (acres)	6,300	-	6,480	6,540	6,560	6,580	6,580
Fire-Related Treatment	1,500	-	1,500	1,500	1,500	1,500	1,500
Timber-Related Fuel Treatment	4,500	-	4,400	4,400	4,400	4,400	4,400
Other Fuel Treatment (for wildlife)	300	-	380	440	460	480	480
Expected Acres Burned by Wildfire			11,000	11,000	11,000	11,000	11,000
Intensity Class 1	32	-	55	55	55	55	55
Intensity Class 2	48	-	154	154	154	154	154
Intensity Class 3	774	-	330	330	330	330	330
Intensity Class 4	850	-	451	451	451	451	451
Intensity Class 5	3,345	-	4,686	4,686	4,686	4,686	4,686
Intensity Class 6	1,350	-	5,324	5,324	5,324	5,324	5,324
Fish							
Inland Fish Other Than T&E							
(M Pounds)	1,424	1,794	1,817	1,817	1,817	1,817	1,817
Anadromous Fish							
Commercial (M Pounds)	363	457	691	691	691	691	691
Sport (M Pounds)	113	142	353	353	353	353	353

* See the last page of this table for abbreviated terms and meanings.

** A base year of 1989 and the 1990 RPA program were used as instructed by the Regional Guide for the Pacific Southwest Region; revised 1990.

Table II-6 (Continued)

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Fish (Continued)							
Direct Habitat Improvement							
Acres/Structures							
Inland Fish	15/25	-	30/90	30/90	30/90	30/90	30/90
Anadromous Fish (Commercial)	0/0	-	0/0	0/0	0/0	0/0	0/0
Anadromous Fish (Sport)	5/50	-	30/64	30/64	30/64	30/64	30/64
Thousand Fish User Days (MFUDs)							
Inland Fish	396	-	410	410	410	410	410
Anadromous Fish (Sport)	40	-	160	160	160	160	160
Human Resources							
Programs (Enrollees)	50	-	50	50	50	50	50
Lands and Minerals							
Land Acquisition (Acres)	6,996	-	1,500	1,500	1,500	1,500	1,500
Minerals (Operating Plans)	122	146	125	137	151	166	183
Range							
Grazing (M AMs)	12	12	11.9	11.9	11.9	11.9	11.9
Recreation							
Developed Public (MM RVDs)	.71		0.75	0.86	0.97	1.09	1.2
Developed Private (MM RVDs)	.49		0.51	0.59	0.68	0.75	0.83
Dispersed (MM RVDs)	2.56	*	2.9	3.4	3.9	4.5	5.3
Wilderness (MM RVDs)	.13		0.14	0.16	0.19	0.22	0.25
Open, Usable OHV Areas-Summer (Acres)	239.2	-	239175	239175	239175	239175	239175
Open, Usable OHV Areas-Winter (Acres)	176.2	-	176200	176200	176200	176200	176200
Roads and Trails							
Open Only to OHV Use-Summer (Miles)	0	-	0	0	0	0	0
Open Only to OHV Use-Winter (Miles)	0	-	0	0	0	0	0
Closed to OHV Use-Summer (Miles)	810	-	810	810	810	810	810
Closed to OHV Use-Winter (Miles)	815	-	815	815	815	815	815
Timber							
Allowable Sale Quantity (MMCF)	28	-	13	13	13	13.7	14.4
Allowable Sale Quantity (MMBF)	184	-	87	87	87	91.3	95.9
Long Term Sustained Yield (MMCF)	-	-	16.4	16.4	16.4	16.4	16.4
Long Term Sustained Yield (MMBF)	-	-	109.6	109.6	109.6	109.6	109.6
Reforestation (Acres)	9,400	8,084	4,600	4,600	4,600	4,600	4,600
Timber Stand Improvement (Acres)	7,800	-	6,600	6,600	6,600	6,600	6,600

Table II-6 (Continued)

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Timber (Continued)							
Wood Products Other Than Sawtimber							
Firewood (M Cords)	21	-	25	30	30	30	30
Visual Quality							
Visual Quality Index	127.3	-	127.3	130.2	131.7	131.5	131.5
Water							
Quality (M Acre feet at standard)	5,448	-	5,438	5,436	5,436	5,433	5,437
Increased Quantity (M acre feet)***	5,450	-	-12	-14	-14	-17	-13
Watershed Improvement (Acres)	399	706	300	300	300	300	300
Wildlife							
Threatened, Endangered and Sensitive Species (TE&S)							
Bald Eagle (# managed pairs)	25	-	32	35	35	35	35
Goshawk (# pairs)	150	-	150	150	150	150	150
Peregrine Falcon (# managed pairs)	6	-	9	14	14	14	14
Spotted Owl (# pairs)	97	-	170	180	190	200	210
Other Than TE&S							
Deer (M animals)	62	-	62	62	62	62	62
Direct Habitat Improvement (MWUDs)							
All Species	2	-	44	51	59	69	61
Acres/Structures of Direct Habitat Improvement							
All Species	1360/35	-	5050/150	8550/180	8652/216	8652/260	8760/310
Wildlife User Days (M WUDs)							
Consumptive Species	282	338	282	282	282	282	282
Non-Consumptive Species	282	347	282	323	375	435	504
Total WUDs	564	-	608	656	716	786	847

*** The value for Decades 1-5 is the difference between the increased quantity, in Base Year 1989, and the projected quality water yield by decade. This is not an indicator of decreased water quality, only of the net increase/decrease of water yield.

Abbreviated Terms and Meanings for this Table.

M=Thousand MM=Million MMBF=Million Board Feet MMCF=Million Cubic Feet

OHV = Off-Highway Vehicle AMs = Animal Months

RVDs = Recreation Visitor Days

TE&S = Threatened, Endangered & Sensitive

WUDs = Wildlife User Days

	Management Prescription	Acres
I	Unroaded Non-Motorized Recreation	65,048
II	Limited Roaded Motorized Recreation	62,926
III	Roaded Recreation	313,878
IV	Roaded, High Density Recreation	6,247
*V	Wilderness Management	498,776
VI	Wildlife Habitat Management	214,962
VII	Threatened, Endangered and Selected Sensitive Species	536,069
**VIII	Timber Management	366,572
***IX	Riparian Management	27,775
X	Special Area Management	25,724
XI	Cultural Resource Management	3,570
TOTAL ACRES		**2,121,547**

* Acreage shown includes Wild and Scenic Rivers, Research Natural Areas, and cultural resource areas within Wildernesses.

** Acreage includes both suitable and unsuitable timber lands.

*** All riparian areas would be managed according to this prescription. Acres do not include riparian area acreage in Prescriptions V and VII.

Alternative RPA (1990 RPA Program Emphasis)

Theme. The goal of Alternative RPA would be to portray how the 1990 RPA program for the Shasta-Trinity could best be implemented.

The primary objective would be to provide products and services at levels expected to help satisfy current and future demands stated in the 1990 RPA program.

Expenditures would be maintained within the RPA specified budget (no more than 20 percent above the current budget).

Timber outputs would not meet historic levels or RPA targets due to policies recently established to protect the northern spotted owl.

Grazing would increase over current levels.

A variety of recreation opportunities would be provided, primarily in a roaded setting. Most of the released roadless areas would be managed as spotted owl habitat.

This alternative would emphasize wildlife species dependent upon late seral stages (e.g., spotted owl), while maintaining acceptable levels of early seral stage habitat.

Refer to **Table II-8** for outputs in this alternative.

Resource Objectives

Air Quality

Emphasis would be to manage for utilization of wood residue, thereby reducing the amount of prescribed burning. Where burning is required to meet management objectives, it would be done only on approved burn days where conditions exist to rapidly disperse the smoke.

Biological Diversity

Allocations would have the effect of emphasizing later seral stage vegetation. All seral stages would remain within the five percent requirement. Chaparral would cycle naturally except for a low level of induced management (prescribed fire). See the wildlife section for more details on biological diversity.

In Alternative RPA over 1,400,000 acres of vegetated lands would be allowed to "cycle naturally". This is defined as continuing through the processes of succession without major induced management by humans. Natural processes would occur such as insects, disease, flood, fire, windthrow, etc. Some management by humans, such as fish/wildlife habitat improvement projects would be allowed to occur. The potential estimated effects of "cycling naturally" for a 50 to 150 year period (very short ecological timeframe) would include but not be limited to:

- Loss of human-induced early seral stage areas;
- tending stands to move towards climax conditions (older seral stages);
- accumulation of dead standing/down materials;
- loss of existing human-induced fragmentation (clearcuts, roads);
- more homogeneous stands;
- reduction in total numbers of some plant/animal species (early seral stages) with increases in others (moderate to older stages);
- an increase in the area occupied by climax species;
- initial increase of shrub/hardwood species in some areas;
- reduction of shrub/hardwood species in closed canopy situations;
- occurrence of natural fire with some induced fire suppression by humans; and
- reduction in active road systems.

Biomass

Logging residues, available for biomass utilization, would be generated on approximately 8,900 acres per year in the 1st decade. Smaller material would also be generated from precommercial thinning activities on about 2,800 acres per year.

Biomass would be available for personal use firewood, energy-producing wood-burning plants, and other appropriate uses. Material would be left in sufficient quantities to provide adequate wildlife habitat and to maintain soil productivity.

Botany

There are no Federally designated threatened or endangered plant species on the Forests.

Sensitive. Alternative RPA would emphasize maintenance of viable populations of all native plant species. Management practices would ensure that no species become threatened or endangered because of Forest Service activities.

Sensitive plant populations would be mapped and recorded. Selected populations would be monitored, and a Species Management Guide would be developed for each species.

Until these guides are developed viability would be maintained by managing habitat to perpetuate the species. In most cases this would involve protecting populations from disturbance. There are instances, however, where disturbance may be necessary to maintain viability of certain sensitive plant species. Land acquisition, special area designations, and cooperative management plans would be used as protection tools.

Population information for sensitive plants would be shared regularly with the California Natural Diversity Data Base and other appropriate agencies.

Cultural Resources

Cultural resources activities would emphasize evaluation of sites to determine resource values so that appropriate management direction could be determined. Areas subject to ground-disturbing activities would be surveyed and evaluated before contracts are committed or activities commence. Except for the ecological unit inventories, surveys would decrease from recent years. Interpretation and enhancement of Prescription XI (Cultural Resource Management) sites would take place in response to new direction in the Cultural Resources program. Monitoring activities would increase. Access, use and integrity of traditional sites and locations important to Native American religious and cultural practices would be maintained.

Facilities

Structures. The administrative site facilities at the Northern California Service Center (NCSC), Hyampom, Big Bend, Hayfork, Weaverville, McCloud, Harrison Gulch, and Lake Shore would be upgraded. The facilities at administrative sites would be operated in a reasonably safe and efficient condition. This may require construction, reconstruction, and/or disposal of structures at each site.

In the interest of cost effectiveness, administrative site leases would be eliminated in favor of agency-owned facilities. A possible exception may be the public information contact site at the south (northbound) arrival station for the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA).

Recreation facilities would receive heavy maintenance and some would be upgraded to handle present day recreation vehicles and to better serve users. Some fire lookouts would be replaced or upgraded because of their extremely poor condition.

Bridge construction and replacement would stress permanent bridges on arterial and collector roads and local roads which are open to the public.

Transportation. The arterial/collector/local road system would be increased and reconstructed as shown in **Table II-8**. No significant changes in classification or jurisdiction would be planned. Seasonal road closures would be recommended to prevent damage to roadway facilities and adjacent resources such as sensitive wildlife areas and highly erosive soils. These closures would take place where needed to meet the Forest standards and guidelines. The road and trail system would be evaluated for compliance with the Riparian standards and guidelines (see Management Prescription IX, proposed Forest Plan, Chapter 4).

Operation and maintenance of the Forests' transportation system would be similar to present standards. No major changes in construction or reconstruction standards would be anticipated. Upgrading of selected important arterial/collectors would be emphasized to increase safety and reduce maintenance and haul costs including provisions to better accommodate passenger cars.

Special emphasis would be given to creating scenic byways to accommodate the needs of those driving for pleasure. Some scenic byways may be created in cooperation with neighboring Forests, the State, Counties, and cost share cooperators.

New trail construction would be relatively high, and a trail or system of trails would be developed on Mt. Shasta.

Maintenance of the Forests' trail system would continue to emphasize logging out for access, prevention of resource damage, and safety of the users.

Fewer cost-share agreement supplements would be processed, since most of the large private land parcels have been accessed. Maintenance of cost-share roads would be emphasized.

Fire and Fuels

Fire suppression would be at the most efficient level as determined by the National Fire Management Analysis System (NFMAS).

Acres burned are expected to be greater than historical averages due to the higher fuel loading across the Forests as a result of other resource needs. This would be due primarily to the allocation of approximately 500,000 acres to Management Prescription VII (Threatened, Endangered, and Selected Sensitive Species) which allows minimal vegetation management and associated fuel treatments and/or the treatment of natural fuels as they occur.

Treatment of natural fuels and resource activity-created fuels is projected to be about 6,580 acres annually during the 1st decade. Where feasible, fuels from timber harvesting would be reduced to the level needed for wildlife and watershed protection by utilization of unmerchantable material.

Protection efforts would be emphasized in high value plantation areas. Flammability reduction would be utilized to help protect plantations. Within the Wildernesses the use of planned and unplanned ignitions for prescribed fire would be utilized. The anticipated burn characteristics would approximate those of pristine or near pristine conditions. Mosaic patterns for wildlife species diversity would be stressed. Wildfire suppression tactics and strategies would utilize "light hand on the land" as found in National Interagency Fire Line Handbook FSH 5109.32a.

Fisheries

Habitat typing surveys and evaluations would be completed on selected anadromous fish streams, on selected redband trout streams with 50 percent or more adjacent National Forest land ownership, on all Class 1 and 2 major perennials, and on most minor inland fish streams.

Efforts would be made to conduct more comprehensive inventories of streamside riparian areas within the Trinity River Basin. Streamside riparian inventories would be completed on most Class 1 and 2 anadromous fish streams.

Natural long-term recovery of non-sensitive and sensitive anadromous fish habitat would be de-emphasized in lieu of increased production goals.

Habitat improvement would occur for anadromous fish in the Trinity River Basin and be significantly increased for warmwater fish at Shasta and Trinity Lakes and for inland coldwater fish on major perennial inland fish streams. Habitat improvement would be increased on minor perennial inland fish streams. Direct fish habitat improvements would occur for rainbow trout and winter-run steelhead to accommodate a significant portion of major consumptive sportfishing.

Forest Pests

This alternative would allow and require that consideration of a full range of pest management measures be integrated into resource management planning and activities. Detection, evaluation, and control of pest-caused damage would be intensively practiced on lands where vegetation would be actively managed, primarily to meet timber management goals.

Minimal pest management would occur on the balance of the land base. This includes protection of other lands from epidemics on National Forest lands, and the protection of the resources in these areas.

Minerals

The orderly development of mineral resources would be encouraged. Any adverse impacts of mineral related activities would be minimized through required lease stipulations and the administration of plans of operation. Plans of operation would require reclamation of lands disturbed by mining.

Range

Grazing use would increase by about 17 percent from current levels. Grazing allotments within Wildernesses would be maintained. Opportunities and expenditures for intensified range management would be increased over the present situation. Water sources would be developed to meet domestic livestock needs.

Recreation

The recreation potential of the Shasta-Trinity National Forests is displayed in 12 geographic "recreation theme areas". These areas represent the framework for developing management opportunties over the next 5 decades. They respond directly to projected recreation demand increases identified in the 1989 USDA Forest Service RPA Assessment. The objective is to identify and develop unique recreation opportunities offered by each theme area, rather than to provide identical opportunities in all locations.

Theme areas would be emphasized in decade 1; they would be maintained through decades 2, 3, 4 and 5.

Descriptions of these theme areas can be found in the Recreation Section of Chapter III.

Developed recreation sites would be operated at the standard service level by the end of the 2nd decade. Assistance from recreation service partners and volunteer organizations would be required to achieve standard service levels. Substandard campgrounds would be rehabilitated at the rate of 4,500 PAOT (people-at-one-time capacity) per decade (90 camping units per year). Picnic sites would be rehabilitated at the rate of 500 PAOT per decade (10 picnic units per year). Interpretive sites would be rehabilitated at the rate of 500 PAOT per decade (five interpretive sites per year). Trailheads would be rehabilitated at the rate of 1,000 PAOT per decade (two trailheads per year).

Trails would be maintained at the standard service level by the end of the 2 decade. Trails would be reconstructed at the rate of 100 miles per decade (10 miles per year). Trails on the Trinity side of the Forests would have the priority for reconstruction efforts. Forest personnel would recruit assistance from volunteers and organizations to leverage Forest Service trail budgets.

New recreation construction would address facility needs within the recreation theme areas. Campgrounds would be constructed at the rate of 800 PAOT per decade (four 40 unit campgrounds per decade). Picnic sites would be constructed at the rate of 1,000 PAOT per decade (twenty 10 unit picnic sites per decade). Interpretive sites would be constructed at the rate of 300 PAOT per decade (30 interpretive sites per decade). Visitor information stations would be constructed at the rate of 100 PAOT per decade (two stations per decade). Visitor information centers would be constructed to provide an additional 200 PAOT (one center per decade, first two decades only). New trailheads would be constructed at a rate of 500 PAOT per decade (one trailhead per year).

New trail construction emphasis would be in the recreation theme areas. These trails would be constructed at the rate of 100 miles per decade (10 miles per year). Old, substandard trails would be removed from the system, as newly constructed trails replace them. In the first 50 years, this would result in 500 miles of new trail.

Wildernesses would be operated at the standard service level by the end of the 2 decade. Emphasis would be to protect and preserve the wilderness quality of the resource while maintaining its availability for the use and enjoyment.

Forest OHV trails and low-standard roads would serve as part of the statewide system and provide long-distance touring opportunities.

Riparian Areas

Maintenance and improvement of riparian resources would be emphasized. Practices to protect stream courses and riparian resources are included in the riparian prescription standards and guidelines which vary in width. They average 350 feet on both sides of Class 1 and 2 streams and 150 feet on both sides of Class 3 and 4 streams. Timber management and other ground-disturbing activities would not be permitted adjacent to Class 1 and 2 streams; they would be modified along Class 3 and 4 streams. Riparian areas would also serve as travel corridors for wildlife.

Soils

Soils would be managed to maintain soil productivity and to prevent excessive surface erosion, mass wasting, soil compaction, and cumulative watershed impacts. A sufficient amount of woody debris and slash would be left after management activities to provide soil protection and organic material. Management activities within unstable areas, such as active landslides and inner gorges, would be restricted. Areas with highly erosive soils would be closed to OHV use.

Special Areas

Research Natural Areas (RNA). This alternative would allocate 13,400 acres of National Forest lands to RNAs. Under this alternative, 5 areas would be proposed for immediate establishment. See **Table IV-8** in Chapter IV for a listing of these areas.

The Pacific Southwest Research Natural Area Committee's refined target system would be used to guide the future selection of RNA candidates. Information from the California Natural Diversity Data Base would be used to assist in locating suitable examples of the target elements.

A management plan would be written for each RNA.

Special Interest Areas (SIA). Thirteen areas would be recommended for designation as SIAs. Six potential areas would be evaluated for SIA status. These are: (1) Dubakella Mountain, (2) McGinnis Springs, (3) Mt. Shasta Scenic Area, (4) Potem Falls, (5) Tilted Rock Lava Flow, and (6) Trout Creek. See **Table IV-10** for the 13 recommended SIAs.

A management plan would be developed for each SIA.

Timber

Timber management activities would be conducted to meet the 1990 RPA timber targets, or to come as close to them as possible. Although the allowable sale quantity (ASQ) target is not achieved in this alternative, relatively high outputs result in an ASQ of 112.4 million board feet (MMBF) in the 1st decade from a suitable timber land base of about 638,100 acres (53 MMBF from the Shasta Forest and 59 MMBF from the Trinity Forest).

On approximately 537,700 acres suitable for timber production, timber management activities would be relatively intensive and yields would be high to moderate. In specially designated areas, timber management would be modified to attain other resource objectives, such as maintenance of visual quality and/or wildlife habitat. On about 100,400 suitable acres, timber management would be minimal in order to emphasize other resource uses, such as semi-primitive recreation, or because of site limitations, which preclude intensive timber management.

Approximately 439,700 suitable acres would be unavailable for timber management in this alternative due to land allocations to other non-timber uses which preclude timber harvesting on a regular basis.

A mix of silvicultural systems would be used to meet management objectives, with an emphasis on even-aged systems. An estimation of the average annual acres and volume harvested in the 1st decade by cutting method is shown in **Table II-7.**

The timber on suitable lands would be managed on an average 120 year rotation (minimum 90 years). This timber harvest schedule would result in about 13.9 percent of the suitable acres being treated in the 1st decade. About 7.4 percent of the suitable acres would be regenerated in the 1st decade.

Clearcutting would be the primary regeneration system used on lands where timber is intensively managed and where timber management is modified for other resource objectives. Units would be larger than five acres, and average about 20 acres in size. No large green reserve trees would be retained within regeneration units on intensively managed lands. However, salvable sub-merchantable conifers would be retained where feasible.

Uneven-aged selection systems would not normally be used except where timber growth and yield is not the primary objective and timber management is modified for other resource objectives.

Stand maintenance, or salvage, would be the primary system used on lands where timber management is minimal.

Emphasis would be on regeneration cutting of understocked stands and stands which are growing poorly. Regeneration cutting would result in an average of 4,700 acres of reforestation per year in the 1st decade. A combination of artificial and natural regeneration would be used to regenerate the Forests. Reforestation would be done using a species mix native to the Forests.

The timber harvest schedule for this alternative would result in an average annual net growth of about 173 MMBF on the suitable lands by the fifth decade. This growth represents an average of about 271 board feet per acre per year on suitable lands.

Release of conifer seedlings (chemical and non-chemical) from competing vegetation would occur on approximately 4,300 acres per year, primarily on lands where timber growth and yield is emphasized.

On suitable timber lands, hardwoods would be managed to provide a continuous supply of firewood and biomass, while providing for wildlife habitat needs.

Table II-7
Timber Cutting Methods (Alternative RPA)

	Acreage		Volume	
Cutting Method	**Acres**	**Percent**	**MMBF**	**Percent**
Clearcut	3,810	43	69	62
Green Tree Retention*	930	10	19	17
Selection	0	0	0	0
Commercial Thinning	3,150	36	19	17
Salvage	1,000	11	5	4
Totals	**8,890**	**100**	**112**	**100**

* Includes Shelterwood cuts.

Visual Quality

Scenic quality would be emphasized along candidate state scenic highways, in the National Recreation Area, on Mt. Shasta, in developed recreation sites and in the foreground of a few sensitive travel corridors. Wildernesses would be managed to preserve the characteristic landscape. Existing wild and scenic rivers and special interest areas would continue to be managed in the foreground to protect scenic quality. Limited protection would be provided for the scenic setting of waterways.

On a small portion of the Forests' land base that emphasizes wood fiber production, management activities would be noticeable. Areas of the Forests would be dominated by roads and vegetative openings which would be out of scale with the characteristic landscape. Openings would be compatible with natural shapes.

Overall, visual quality would receive slightly less emphasis than in any other alternative.

Water

The primary emphasis would be to maintain water quality and quantity in order to meet domestic use needs and fish habitat requirements. Water quality for beneficial uses would be maintained through the use of Best Management Practices (BMPs). (See the Riparian Areas section for a discussion of RMZ widths.)

Watersheds in a degraded condition would be improved at the rate of about 700 acres per year. No specific management activities would be planned to change water yield.

Wild and Scenic Rivers

This alternative would include 106.4 miles (National Forest land only) of existing Wild, Scenic, and Recreation Rivers including New River, the North Fork Trinity River, the South Fork Trinity River, and the mainstem Trinity River. No additional rivers would be recommended for designation.

Wilderness and Roadless Areas

Existing Wildernesses would be maintained under this alternative. Included would be the Yolla Bolly-Middle Eel Wilderness with 36,805 acres (Shasta-Trinity National Forests' portion only) as well as the Wildernesses designated in the 1984 California Wilderness Act. Acreage shown is National Forest land only.

Wilderness	Acres
Castle Crags	10,483
Chanchelulla	7,800
Mt. Shasta	38,560
Trinity Alps	405,128

A total of 498,776 acres on the Shasta-Trinity National Forests would be managed as part of the National Wilderness Preservation System.

Approximately 71 percent of the 29 released roadless area's acreage would remain undeveloped. This is because much of the later seral stage vegetation exists in these roadless areas; it was allocated as habitat for older seral stage dependent species (spotted owl).

Wildlife

Wildlife management objectives would maintain habitat to support all species on the Forests at or above viable population levels. The distribution and variety of wildlife habitat would be maintained.

Management indicators, or wildlife assemblages, would be managed to benefit all species that are represented by the assemblage. Forest standards and guidelines pertaining to special habitat components (i.e. snags, hardwoods, dead and down material, seral stages, etc.) would set the minimum level of management throughout the Forests.

An average of at least 1.5 snags and 5 tons of dead/down material per acre would be maintained. This snag and dead/down level would most likely be exceeded on those areas of the Forests where timber management is not scheduled, or about 70 percent of the Forests.

Hardwood forest types would be managed primarily for the benefit of deer, bear and gray squirrel but not for conversion to conifers.

In the 1st decade, direct habitat improvement would be done annually on 8,224 acres for all species.

Habitat capability would exist after the 5th decade for an additional 12,000 deer, to help maintain consumptive wildlife user days (WUDs).

About 182,612 acres would be allocated to Prescription VI (Wildlife Management) in this alternative. Included are deer winter ranges and 5,000 to 6,000 acres of bitterbrush. This prescription alters timber management practices, provides an average of at least 30 square feet of basal area per acre in hardwoods, and minimizes

disturbances to wildlife that may take place through use of the Forests' transportation network.

Wildlife - Threatened, Endangered (T&E), and Sensitive Species

All known or future sites of Federally listed threatened or endangered (T&E) species or Regional Forester identified sensitive species would be fully protected and managed according to the recovery plan and/or habitat requirements for each species.

Environment to be Created

By the year 2040, about 70 percent of the Forests would remain in a fairly natural condition. This percentage would be in relatively large, contiguous blocks including five wildernesses, five research natural areas, four wild and scenic rivers, and spotted owl habitat (HCAs and CHAs)

Areas managed for their riparian values along perennial streams would also contribute to a naturally appearing landscape, but would be relatively small, narrow strips of land. Large portions of the 29 former roadless areas would remain unroaded.

Areas seen from major State highways and high use recreation sites would remain relatively unchanged. Forest activities would be visible from most county and forest roads. Forest activities would not be evident in areas with distinctive landscapes.

On the remaining 30 percent of the Forests, forest management activities would be evident. These areas would be modified to varying degrees by activities such as timber harvesting, road construction, developed recreation areas, and mining.

In 50 years, about 11 percent of the Forests would consist of stands which are less than 50 years of age. These regenerated stands would generally consist of larger even-aged stands (greater than 5 acres) on the 11 percent. Smaller even-aged and uneven-aged stands would be normal on only a minor portion of the Forests where timber activities occur.

Wildlife habitat would be less diverse than it is today, with more habitat in the late seral stages and less habitat in the early seral stages.

The number of acres allocated to each management prescription under Alternative RPA follows:

Table II-8
Average Annual Outputs by Decade - Alternative RPA*

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Economics							
Total Budget (MM$)	40	-	43.1	42.3	43.8	44.2	47.3
Total Cost (MM$)	44	-	56.8	56	57.5	57.8	60.9
Facilities							
Transportation							
Trail Construction/Reconstruction (miles)	0/1	-	10/10	10/10	10/10	10/10	10/10
Road Construction (miles)	63	-	23	11	11	5	5
Road Reconstruction (miles)	73	-	22	23	21	21	22
Road Maintenance (miles)	6,500	-	6,580	6,690	6,800	6,850	6,900
Dams and Reservoirs (number)							
Forest Service	2	-	2	2	2	2	2
Other Federal	3	-	3	3	3	3	3
Other State/Local	1	-	1	1	1	1	1
Private	10	-	10	10	10	10	10
Administrative Sites (number)							
Forest Service Owned	24	-	26	26	26	26	26
Leased	2	-	0	0	0	0	0
Fire and Fuels							
Total Fuel Treatment (acres)	6,300	-	6,580	6,640	6,660	6,680	6,680
Fire-Related Treatment	1,500	-	1,500	1,500	1,500	1,500	1,500
Timber-Related Fuel Treatment	4,500	-	4,700	4,700	4,700	4,700	4,700
Other Fuel Treatment (for wildlife)	300	-	380	440	460	480	480
Expected Acres Burned by Wildfire			11,000	11,000	11,000	11,000	11,000
Intensity Class 1	32	-	55	55	55	55	55
Intensity Class 2	48	-	154	154	154	154	154
Intensity Class 3	774	-	330	330	330	330	330
Intensity Class 4	850	-	451	451	451	451	451
Intensity Class 5	3,345	-	4,686	4,686	4,686	4,686	4,686
Intensity Class 6	1,350	-	5,324	5,324	5,324	5,324	5,324
Fish							
Inland Fish Other Than T&E							
(M Pounds)	1,424	1,794	1,947	1,947	1,947	1,947	1,947
Anadromous Fish							
Commercial (M Pounds)	363	457	691	691	691	691	691
Sport (M Pounds)	113	142	563	563	563	563	563

* See the last page of this table for abbreviated terms and meanings.

** A base year of 1989 and the 1990 RPA program were used as instructed by the Regional Guide for the Pacific Southwest Region; revised 1990.

Table II-8 (Continued)

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Fish (Continued)							
Direct Habitat Improvement							
Acres/Structures							
Inland Fish	15/25	-	80/125	80/125	80/125	80/125	80/125
Anadromous Fish (Commercial)	0/0	-	0/0	0/0	0/0	0/0	0/0
Anadromous Fish (Sport)	5/50	-	30/120	30/120	30/120	30/120	30/120
Thousand Fish User Days (MFUDs)							
Inland Fish	396	-	415	415	415	415	415
Anadromous Fish (Sport)	40	-	265	265	265	265	265
Human Resources							
Programs (Enrollees)	50	-	50	50	50	50	50
Lands and Minerals							
Land Acquisition (Acres)	6,996	-	1,500	1,500	1,500	1,500	1,500
Minerals (Operating Plans)	122	146	131	144	159	175	192
Range							
Grazing (M AMs)	12	12	14.2	14.2	14.2	14.2	14.2
Recreation							
Developed Public (MM RVDs)	.71		0.75	0.77	0.88	1.0	1.11
Developed Private (MM RVDs)	.49		0.51	0.68	0.77	0.84	0.92
Dispersed (MM RVDs)	2.56	*	2.9	3.4	3.9	4.5	5.3
Wilderness (MM RVDs)	.13		0.14	0.16	0.19	0.22	0.25
Open, Usable OHV Areas-Summer (Acres)	239.2	-	256120	256120	256120	256120	256120
Open, Usable OHV Areas-Winter (Acres)	176.2	-	198730	198730	198730	198730	198730
Roads and Trails							
Open Only to OHV Use-Summer (Miles)	0	-	0	0	0	0	0
Open Only to OHV Use-Winter (Miles)	0	-	0	0	0	0	0
Closed to OHV Use-Summer (Miles)	810	-	810	810	810	810	810
Closed to OHV Use-Winter (Miles)	815	-	815	815	815	815	815
Timber							
Allowable Sale Quantity (MMCF)	28	-	16.9	16.9	16.9	17.7	18.6
Allowable Sale Quantity (MMBF)	184	-	112.4	112.4	112.4	118.0	123.9
Long Term Sustained Yield (MMCF)	-	-	20.5	20.5	20.5	20.5	20.5
Long Term Sustained Yield (MMBF)	-	-	136.7	136.7	136.7	136.7	136.7
Reforestation (Acres)	9,400	8,084	4,700	4,700	4,700	4,700	4,700
Timber Stand Improvement (Acres)	7,800	-	7,100	7,100	7,100	7,100	7,100

Table II-8 (Continued)

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Timber (Continued)							
Wood Products Other Than Sawtimber							
Firewood (M Cords)	21		25	30	30	30	30
Visual Quality							
Visual Quality Index	127.3		127.4	130.1	128.1	128.1	128.1
Water							
Quality (M Acre feet at standard)	5,448	-	5,462	5,464	5,460	5,456	5,458
Increased Quantity (M acre feet)***	5,450	-	+12	+14	+10	+6	+8
Watershed Improvement	399	706	700	710	450	300	300
Wildlife							
Threatened, Endangered and Sensitive Species (TE&S)							
Bald Eagle (# managed pairs)	25	-	32	35	35	35	35
Goshawk (# pairs)	150	-	150	150	150	150	150
Peregrine Falcon (# managed pairs)	6	-	9	14	14	14	14
Spotted Owl (# pairs)	97	-	170	180	190	200	210
Other Than TE&S							
Deer (M animals)	62	-	62	65	68	71	74
Direct Habitat Improvement (MWUDs)							
All Species	2	-	65	113	167	253	393
Acres/Structures of Direct Habitat Improvement							
All Species	1360/35	-	8224/126	8224/151	8310/181	8310/217	7670/260
Wildlife User Days (M WUDs)							
Consumptive Species	282	338	282	282	282	282	282
Non-Consumptive Species	282	347	282	323	375	435	504
Total WUDs	564	-	629	718	824	970	1,179

*** The value for Decades 1-5 is the difference between the increased quantity, in Base Year 1989, and the projected quality water yield by decade. This is not an indicator of decreased water quality, only of the net increase/decrease of water yield.

Abbreviated Terms and Meanings for this Table.

M = Thousand MM = Million MMBF = Million Board Feet MMCF = Million Cubic Feet

OHV = Off-Highway Vehicle AMs = Animal Months

RVDs = Recreation Visitor Days

TE&S = Threatened, Endangered & Sensitive

WUDs = Wildlife User Days

	Management Prescription	Acres
I	Unroaded Non-Motorized Recreation	22,092
II	Limited Roaded Motorized Recreation	11,388
III	Roaded Recreation	292,556
IV	Roaded High Density Recreation	6,290
*V	Wilderness Management	498,776
VI	Wildlife Habitat Management	182,612
VII	Threatened, Endangered and Selected Sensitive Species	530,358
**VIII	Timber Management	537,354
***IX	Riparian Management	27,775
X	Special Area Management	8,776
XI	Cultural Resource Management	3,570
TOTAL ACRES		**2,121,547**

* Acreage shown includes Wild and Scenic Rivers, Research Natural Areas, and cultural resource areas within Wildernesses.

** Acreage includes both suitable and unsuitable timber lands.

*** All riparian areas would be managed according to this prescription. Acres do not include riparian area acreage in Prescriptions V and VII.

Alternative CUR (No Action/No Change)

Theme. The goal of Alternative CUR would be to continue the current (1989) level and mix of outputs based on current land allocations, directions, policies and practices. Goods and services would be provided at 1989 levels to the extent possible given recent threatened and endangered species listings.

This alternative would act as a baseline and represent the current resource management direction as reflected in existing plans on the Forests.

Expenditures (budgets) would not exceed 1989 levels.

Timber outputs would be provided at about one-half historic levels due to policies recently established to protect the northern spotted owl. The current mix of silvicultural practices would be employed.

Non-market forest resources, such as research natural areas and wild and scenic rivers, would continue to be protected at existing levels.

A variety of recreation opportunities would be provided, primarily in a roaded setting.

Refer to **Table II-10** for outputs in this alternative.

Resource Objectives

Air Quality

Current State air quality standards would be met. Prescribed burning would be accomplished only when conditions are favorable for smoke dispersion and standards can be attained.

Biological Diversity

Allocations would have the effect of empasizing later seral stage vegetation. All seral stages would remain within the five percent requirement. Chaparral would cycle naturally except for a low level of induced management (prescribed fire). See the wildlife section for more details on biological diversity.

Biomass

Logging residues, available for biomass utilization, would be generated on approximately 9,700 acres per year in the first decade. Smaller biomass material would also be generated from precommercial thinning activities on about 3,100 acres per year.

Biomass would be available for personal use firewood, energy-producing wood-burning plants, and other appropriate uses. Material would be left in sufficient quantities to provide adequate wildlife habitat and to maintain soil productivity.

Botany

There are no Federally designated threatened or endangered plant species on the Forests.

Sensitive. Alternative CUR would emphasize maintenance of viable populations of all native plant species. Management practices would ensure that no species become threatened or endangered because of Forest Service actiivities.

Sensitive plant populations would be mapped and recorded. Selected populations would be monitored, and a Species Management Guide would be developed for each species.

Until these guides are developed viability would be maintained by managing habitat to perpetuate the species. In most cases this would involve protecting populations from disturbance. There are instances, however, where disturbance may be necessary to maintain viability of certain sensitive plant species. Land acquisition, special area designations, and cooperative management plans would be used as protection tools.

Population information for sensitive plants would be shared regularly with the California Natural Diversity Data Base and other appropriate agencies.

Cultural Resources

A continuation of the present situation would see cultural resources management activities carried out primarily as a support function (e.g., for timber). Areas subject to ground-disturbing activites would be surveyed and recorded sites evaluated before contracts were awarded or activities commence. Some interpretation, research, and enhancement would take place. Active protection and monitoring would increase. Access, use, and integrity of traditional sites and locations important to Native American religious and cultural practices would be maintained.

Facilities

Structures. The administrative site facilities at the Northern California Service Center (NCSC), Hyampom, Big Bend, Hayfork, Weaverville, McCloud, Harrison Gulch, and Lake Shore would be upgraded.

In the interest of cost effectiveness, administrative site leases would be eliminated in favor of agency-owned facilities. A possible exception may be the public information contact site at the south (northbound) arrival station for the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA).

Recreation facilities would receive heavy maintenance and some would be upgraded to handle present day recreation vehicles and to better serve users. Some fire lookouts would be replaced or upgraded because of their extremely poor conditions.

All facilities would be operated in a reasonably safe and efficient manner. This may require construction, reconstruction and/or obliteration of some buildings or systems.

Bridge construction and replacement would stress permanent bridges on arterial and collector roads and local roads open to the public.

Transportation. The arterial/collector/local road system would be increased and reconstructed as shown in **Table II-10**. No significant changes in classification or jurisdiction would be planned. Seasonal road closures would be recommended to prevent damage to roadway facilities and adjacent resources such as sensitive wildlife areas and highly erosive soils. These closures would take place where needed to meet the Forest standards and guidelines. The road and trail system would be evaluated for compliance with the Riparian standards and guidelines (see Management Prescription IX, proposed Forest Plan Chapter 4).

Operation and maintenance of the Forests' transportation system would be similar to present standards. No major changes in construction or reconstruction standards would be anticipated. Upgrading of selected important arterial/collectors would be emphasized to increase safety and reduce maintenance and haul costs including provisions to better accommodate passenger cars.

Special emphasis would be given to creating scenic byways to accommodate the needs of those driving for pleasure. Some scenic byways may be created in cooperation with neighboring Forests, the State, Counties, and cost share cooperators.

New trail construction would remain low, but a trail or system of trails would be developed on Mt. Shasta.

Maintenance of the Forests' trail system would continue to emphasize logging out for access, prevention of resource damage, and safety of the users.

Fewer cost-share agreement supplements would be processed since most of the large private land parcels have been accessed. Maintenance of cost-share roads would be emphasized.

Fire and Fuels

Fire suppression would be at current levels. This would be approximately 71 percent of the most efficient level as determined by the National Fire Management Analysis system (NFMAS).

Acres burned are expected to be greater than historical averages due to the higher fuel loading across the Forests as a result of other resource needs. This would be due primarily to the allocation of approximately 500,000 acres to Management Prescription VII (Threatened, Endangered, and Selected Sensitive Species) which allows minimal vegetation management and associated fuel treatments and/or the treatment of natural fuels as they occur.

Treatment of natural fuels and resource activity-created fuels is projected to be about 7,080 acres annually during the 1st decade. Where feasible, fuels from timber harvesting would be reduced to the level needed for wildlife and watershed protection by utilization of unmerchantable material.

Protection efforts would be emphasized in high value plantation areas. Flammability reduction would be utilized to help protect plantations. Within the Wildernesses the use of planned and unplanned ignitions for prescribed fire would be utilized. The anticipated burn characteristics would approximate those of pristine or near pristine conditions. Mosaic patterns for wildlife species diversity would be stressed. Wildfire suppression tactics and strategies would utilize "light hand on the land" as found in National Interagency Fire Line Handbook FSH 5109.32a.

Fisheries

Habitat typing surveys and evaluations would be completed on selected anadromous fish streams, on selected redband trout streams with 50 percent or more adjacent National Forest land ownership, and on a few Class 1 major perennials. No minor perennial inland fish streams would be habitat typed.

Streamside riparian inventories would be completed on a few Class 1 anadromous fish streams.

Limited emphasis would be placed on the natural long-term recovery of non-sensitive and sensitive anadromous fish habitat.

Habitat improvement would continue at a low to moderate emphasis level for anadromous fish in the Trinity River Basin and for warmwater fish at Shasta and Trinity Lakes. Limited fish habitat improvement would occur on a few major perennial inland fish streams. No fish habitat improvement would occur on minor perennial inland fish streams. Direct fish habitat improvements would occur for steelhead trout, largemouth bass, redband trout, and for rainbow trout in a few major perennial streams to accommodate some major consumptive sportfishing.

Forest Pests

This alternative would allow and require that consideration of a full range of pest management measures be integrated into resource management activities. Detection, evaluation, and control of pest-caused damage would be intensively practiced on those lands where vegetation would be managed, primarily to meet timber management goals. Minimal pest management would occur on the remaining land base to protect other lands and resource values from epidemics. Integrated pest management would be practiced at levels appropriate with the management prescriptions for the site specific/special purpose areas.

Minerals

The orderly development of mineral resources would be encouraged. Any adverse impacts of mineral related activities would be minimized through required lease stipulations and the administration of plans of operation. Plans of operation would require reclamation of lands disturbed by mining.

Range

Overall, livestock grazing would be the same as current levels. Grazing use within the transitory range in Habitat Conservation Areas would be reduced. Opportunities for improved range management, particularly in riparian areas, would increase over the present level. Grazing use would be managed so that riparian habitats are maintained or improved. Water sources would be developed to meet domestic livestock needs.

Recreation

Most of the developed recreation sites would be operated at less than the standard service level. Assistance from various partners would be required to achieve standard service levels. Substandard campgrounds would be rehabilitated at the rate of 2,250 PAOT (people-at-one-time capacity) per decade (45 camping units per year). Picnic sites would be rehabilitated at the rate of 250 PAOT per decade (five picnic units per year). Interpretive sites would be rehabilitated at the rate of 100 PAOT per decade (one interpretive site per year). Trailheads would be rehabilitated at the rate of 500 PAOT per decade (one trailhead per year).

Twenty percent of the trails would be maintained at the standard service level and 80 percent of the trails would be maintained at less than the standard service level. Trails would be reconstructed at the rate of 20 miles per decade (two miles per year). Forest personnel would recruit assistance from volunteers and organizations to leverage Forest Service budgets.

New campgrounds would be constructed at the rate of 250 PAOT per decade (one 50 unit campground per decade). Picnic sites would be constructed at the rate of 100 PAOT per decade (two 10 unit picnic sites per decade). Interpretive sites would be constructed at the rate of 100 PAOT per decade (10 interpretive sites per decade). New trailheads would be constructed at a rate of 50 PAOT per decade (one trailhead per decade).

New trails would be constructed at the rate of 20 miles per decade (two miles per year).

Wildernesses would be operated at less than the standard service level. Emphasis would be to protect and preserve the wilderness quality of the resource.

Forest OHV trails and low-standard roads would serve as part of the statewide system and provide long-distance touring opportunities.

Riparian Areas

Maintenance and improvement of riparian resources would be emphasized. Practices to protect stream courses and riparian resources are included in the riparian prescription standards and guidelines which vary in width. They average 350 feet on both sides of Class 1 and 2 streams and 150 feet on both sides of Class 3 and 4 streams. Timber management and other ground-disturbing activities would not be permitted adjacent to Class 1 and 2 streams; they would be modified along Class 3 and 4 streams. Riparian areas would also serve as travel corridors for wildlife.

Soils

Soils would be managed to maintain soil productivity and to prevent excessive surface erosion, mass wasting, soil

compaction, and cumulative watershed impacts. A sufficient amount of woody debris and slash would be left after management activities to provide soil protection and organic material. Management activities within unstable areas, such as active landslides and inner gorges, would be restricted. Areas with highly erosive soils would be closed to OHV use.

Special Areas

Research Natural Areas (RNA). This alternative would allocate 21,470 acres of National Forest lands to RNAs. Under this alternative, 8 areas would be proposed for immediate establishment. See **Table IV-8** in Chapter IV for a listing of these areas.

The Pacific Southwest Research Natural Area Committee's refined target system would be used to guide the future selection of RNA candidates. Information from the California Natural Diversity Data Base would be used to assist in locating suitable examples of the target elements.

A management plan would be written for each RNA.

Special Interest Areas (SIA). Nine areas would be recommended for designation as SIAs. No additional areas would be evaluated for potential SIA classification. Refer to **Table IV-10** for a listing of these areas.

A management plan would be developed for each SIA.

Timber

Timber management activities would be conducted to achieve the current (1989) level of timber outputs, based on current management direction from existing Multiple Use Plans and Timber Management Plans, and current (1989) budget levels. This alternative would result in an average annual allowable sale quantity (ASQ) of 105.9 million board feet (MMBF) in the 1st decade from a suitable timber land base of about 635,800 acres (51 MMBF from the Shasta Forest and 55 MMBF from the Trinity Forest).

On approximately 502,800 acres suitable for timber production, timber management activities would be relatively intensive and yields would be high to moderate. In specially designated areas, timber management would be modified to attain other resource objectives, such as maintenance of visual quality and/or wildlife habitat. On about 133,000 suitable acres, timber management would be minimal in order to emphasize other resource uses, such as semi-primitive recreation, or because of site limitations, which preclude intensive timber management.

Approximately 442,000 suitable acres would be unavailable for timber management in this alternative due to land allocations to other non-timber uses which preclude timber harvesting on a regular basis.

A mix of silvicultural systems would be used to meet management objectives, with an emphasis on even-aged systems. An estimation of the average annual acres and volume harvested in the 1st decade by cutting method is shown in **Table II-9.**

The timber on suitable lands would be managed on an average 120 year rotation (minimum 90 years). This timber harvest schedule would result in about 15.2 percent of the suitable acres being treated in the 1st decade. About 8.2 percent of the suitable acres would be regenerated in the 1st decade.

Clearcutting would be the primary regeneration system used on lands where timber is intensively managed, such as in the General Forest Zone of the Multiple Use Plans (MUP). Units would generally be larger than five acres, and average about 15 to 20 acres in size. Reserve trees would be retained within some regeneration units.

Table II-9
Timber Cutting Methods (Alternative CUR)

	Acreage		Volume	
Cutting Method	**Acres**	**Percent**	**MMBF**	**Percent**
Clearcut	3,160	33	43	40
Green Tree Retention*	1,780	18	37	35
Selection	300	3	2	2
Commercial Thinning	2,820	29	17	16
Salvage	1,600	17	7	7
Totals	**9,660**	**100**	**106**	**100**

* Includes Shelterwood cuts.

Reserve trees would normally consist of salvable sub-merchantable conifers and large green trees.

Other cutting methods would be used where timber management is modified for other resource objectives, such as in the Travel Influence and Water Influence Zones of the MUP.

Stand maintenance, or salvage, would be the primary system used on lands where timber management is minimal.

Only a minor amount of uneven-aged selection cutting would be used in this alternative.

Emphasis would be on regeneration cutting of understocked stands and stands which are growing poorly. Regeneration cutting would result in an average of 5,200 acres of reforestation per year in the 1st decade. A combination of artificial and natural regeneration would be used to regenerate the Forests. Reforestation would be done using a species mix native to the Forests.

The timber harvest schedule for this alternative would result in an average annual net growth of about 190 MMBF on suitable lands by the fifth decade. This growth represents an average of about 300 board feet per acre per year on suitable lands.

Release of conifer seedlings (chemical and non-chemical) from competing vegetation would occur on approximately 4,700 acres per year, primarily on lands where timber growth and yield is emphasized.

On suitable timber lands, hardwoods would be managed to provide a continuous supply of firewood and biomass, while providing for wildlife habitat needs.

Visual Quality

Scenic quality would be emphasized along candidate state scenic highways, in the National Recreation Area, on Mt. Shasta, in developed recreation sites, and in the foreground of most sensitive travel corridors. Wildernesses would be managed to preserve the characteristic landscape. Existing wild and scenic rivers and special interest areas would be managed in the foreground to provide special emphasis for scenic quality. Moderate protection would be provided for the scenic setting of waterways.

Management activities would dominate the landscape on only a small portion of the land base that emphasizes wood fiber production. In those areas roads and vegetative openings would be noticeable and would be out of scale with openings in the characteristic landscape but would be compatible with natural shapes.

Water

The primary emphasis would be to maintain water quality and quantity in order to meet domestic uses and fish habitat requirements. A primary objective would be to maintain the quality of water at or above State objectives. Water quality for beneficial uses would be protected through the use of Best Management Practices (BMPs). (See the Riparian Areas section for a discussion of RMZ widths.)

Watersheds in a degraded condition would be improved at the rate of about 300 acres per year. No specific management activities would be planned for the purpose of changing water yield.

Wild and Scenic Rivers

This alternative would include 106.4 miles (National Forest land only) of the existing Wild, Scenic, and Recreation Rivers including New River, the North Fork Trinity River, the South Fork Trinity River, and the mainstem Trinity River. No additional rivers would be recommended for designation.

Wilderness and Roadless Areas

Existing Wildernesses would be maintained under this alternative. Included would be the Yolla Bolly-Middle Eel Wilderness with 36,805 acres (Shasta-Trinity National Forests' portion only) as well as the Wildernesses designated in the 1984 California Wilderness Act. Acreage shown is National Forest land only.

Wilderness	Acres
Castle Crags	10,483
Chanchelulla	7,800
Mt. Shasta	38,560
Trinity Alps	405,128

A total of 498,776 acres on the Shasta-Trinity National Forests would be managed as part of the National Wilderness Preservation System.

Approximately 72 percent of the 29 released roadless area's acreage would remain undeveloped. This is because much of the later seral stage vegetation exists in these roadless areas; it was allocated as habitat for older seral stage dependent species (spotted owl).

The Mt. Eddy Further Planning Area (7,720 acres) would be managed primarily for semi-primitive motorized recreation.

Wildlife

Wildlife management objectives would maintain habitat to support all species on the Forests at or above viable population levels. The distribution and variety of wildlife habitat would be maintained.

Management indicators, or wildlife assemblages, would be managed to benefit all species that are represented by the assemblage. Forest standards and guidelines pertaining to special habitat components (i.e., snags, hardwoods, dead and down material, seral stages, etc) would set the minimum level of management throughout the Forests.

An average of at least 1.5 snags and 5 tons of dead/down material per acre would be maintained. This snag and dead/down level would most likely be exceeded on those areas of the Forests where timber is not intensively managed, or about 70 percent of the Forests.

Hardwood forest types would be managed primarily for the benefit of wildlife and not for conversion to conifers.

In the 1st decade, direct habitat improvement would be done annually on 2,081 acres for all species.

About 114,509 acres would be allocated to Prescription VI (Wildlife Management) in this alternative. Included in this prescription are deer winter ranges and 5,000 to 6,000 acres of bitterbrush. This prescription has timber management for the benefit of wildlife, provides an average of at least 30 square feet of basal area per acre in hardwoods, and minimizes disturbances to wildlife that may take place through use of the Forests' transportation network.

Wildlife - Threatened, Endangered (T&E), and Sensitive Species

All known or future sites of Federally listed threatened or endangered (T&E) species or Regional Forester identified sensitive species would be fully protected and managed according to the recovery plan and/or habitat requirements for each species.

Environment to be Created

By the year 2040, the Forests would not have changed appreciably in appearance. About 70 percent of the Forests would remain in a fairly natural condition. This percentage would be in relatively large, contiguous blocks including five wildernesses, eight research natural areas, four wild and scenic rivers, and Management Prescription VII (Threatened, Endangered, and Selected Sensitive Species).

Areas managed for their riparian values would also contribute to a naturally appearing landscape, particularly along perennial streams.

Areas seen from State highways, county roads, forest roads with high recreation use, and recreation sites, which are currently undisturbed, would remain relatively unchanged. Forest activities would not be evident in areas with distinctive landscapes.

On the remaining 30 percent of the Forests, forest management activities would be evident. These areas would be modified to varying degrees by activities such as timber harvesting, road construction, developed recreation areas, and mining.

In 50 years, about 12 percent of the Forests would consist of stands which are less than 50 years of age. These regenerated stands would generally consist of larger even-aged stands (greater than 5 acres) on about 11 percent of the Forests. Smaller even-aged and uneven-aged stands would be normal on the remaining 1 percent of the Forests where timber activities occur.

Wildlife habitat would be different than it is today, with more habitat in the late seral stages.

The number of acres allocated to each Management Prescription under Alternative CUR follows:

Table II-10
Average Annual Outputs by Decade - Alternative CUR*

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Economics							
Total Budget (MM$)	40	-	39.8	37.5	39.5	40.0	43.0
Total Cost (MM$)	44	-	53.4	56.1	58.1	58.7	61.6
Facilities							
Transportation							
Trail Construction/Reconstruction (miles)	0/1	-	2/2	2/2	2/2	2/2	2/2
Road Construction (miles)	63	-	23	11	11	5	5
Road Reconstruction (miles)	73	-	22	23	22	22	23
Road Maintenance (miles)	6,500	-	6580	6690	6800	6850	6900
Dams and Reservoirs (number)							
Forest Service	2	-	2	2	2	2	2
Other Federal	3	-	3	3	3	3	3
Other State/Local	1	-	1	1	1	1	1
Private	10	-	10	10	10	10	10
Administrative Sites (number)							
Forest Service Owned	24	-	26	26	26	26	26
Leased	2	-	0	0	0	0	0
Fire and Fuels							
Total Fuel Treatment (acres)	6,300	-	7,080	7,140	7,160	7,180	7,180
Fire-Related Treatment	1,500	-	1,500	1,500	1,500	1,500	1,500
Timber-Related Fuel Treatment	4,500	-	5,200	5,200	5,200	5,200	5,200
Other Fuel Treatment (for wildlife)	300	-	380	440	460	480	480
Expected Acres Burned by Wildfire			15,000	15,000	15,000	15,000	15,000
Intensity Class 1	32	-	75	75	75	75	75
Intensity Class 2	48	-	210	210	210	210	210
Intensity Class 3	774	-	450	450	450	450	450
Intensity Class 4	850	-	615	615	615	615	615
Intensity Class 5	3,345	-	6,390	6,390	6,390	6,390	6,390
Intensity Class 6	1,350	-	7,260	7,260	7,260	7,260	7,260
Fish							
Inland Fish Other Than T&E							
(M Pounds)	1,424	1,794	1,557	1,557	1,639	1,734	1,734
Anadromous Fish							
Commercial (M Pounds)	363	457	691	691	691	691	691
Sport (M Pounds)	113	142	293	353	413	413	413

* See the last page of this table for abbreviated terms and meanings.

** A base year of 1989 and the 1990 RPA program were used as instructed by the Regional Guide for the Pacific Southwest Region; revised 1990.

Table II-10
(Continued)

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Fish (Continued)							
Direct Habitat Improvement							
Acres/Structures							
Inland Fish	15/25	-	17/35	17/35	17/50	17/70	17/70
Anadromous Fish (Commercial)	0/0	-	0/0	0/0	0/0	0/0	0/0
Anadromous Fish (Sport)	5/50	-	20/48	20/64	20/80	20/80	20/80
Thousand Fish User Days (MFUDs)							
Inland Fish	396	-	374	374	390	404	406
Anadromous Fish (Sport)	40	-	130	160	190	190	190
Human Resources							
Programs (Enrollees)	50	-	50	50	50	50	50
Lands and Minerals							
Land Acquisition (Acres)	6,996	-	1,500	1,500	1,500	1,500	1,500
Minerals (Operating Plans)	122	-	125	137	151	166	183
Range							
Grazing (M AMs)	12	-	12	12	12	12	12
Recreation							
Developed Public (MM RVDs)	.71		0.75	0.86	0.56	0.63	0.69
Developed Private (MM RVDs)	.49		0.51	0.59	0.68	0.75	0.83
Dispersed (MM RVDs)	2.56	*	2.8	3.2	3.7	4.3	5.0
Wilderness (MM RVDs)	.13		0.14	0.16	0.19	0.22	0.25
Open, Usable OHV Areas-Summer (Acres)	239.2	-	243020	243020	243020	243020	243020
Open, Usable OHV Areas-Winter (Acres)	176.2	-	187720	187720	187720	187720	187720
Roads and Trails							
Open Only to OHV Use-Summer (Miles)	0	-	0	0	0	0	0
Open Only to OHV Use-Winter (Miles)	0	-	0	0	0	0	0
Closed to OHV Use-Summer (Miles)	810	-	810	810	810	810	810
Closed to OHV Use-Winter (Miles)	815	-	815	815	815	815	815
Timber							
Allowable Sale Quantity (MMCF)	28	-	15.9	15.9	15.9	16.7	17.5
Allowable Sale Quantity (MMBF)	184	-	105.8	105.8	105.8	111.1	116.6
Long Term Sustained Yield (MMCF)	-	-	19.1	19.1	19.1	19.1	19.1
Long Term Sustained Yield (MMBF)	-	-	127.4	127.4	127.4	127.4	127.4
Reforestation (Acres)	9,400	8,084	5,200	5,200	5,200	5,200	5,200
Timber Stand Improvement (Acres)	7,800	-	7,800	7,800	7,800	7,800	7,800

Table II-10 (Continued)

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Timber (Continued)							
Wood Products Other Than Sawtimber							
Firewood (M Cords)	21	-	25	30	30	30	30
Visual Quality							
Visual Quality Index	127.3	-	127.2	129.9	129.8	129.8	129.8
Water							
Quality (M Acre feet at standard)	5,448	-	5,458	5,456	5,454	5,454	5,453
Increased Quantity (M acre feet)***	5,450	-	+8	+6	+4	+4	+3
Watershed Improvement	399	706	300	300	300	300	300
Wildlife							
Threatened, Endangered and Sensitive Species (TE&S)							
Bald Eagle (# managed pairs)	25	-	32	35	35	35	35
Goshawk (# pairs)	150	-	150	150	150	150	150
Peregrine Falcon (# managed pairs)	6	-	9	14	14	14	14
Spotted Owl (# pairs)	97	-	72	72	72	72	72
Other Than T&E							
Deer (M animals)	62	-	62	62	62	62	62
Direct Habitat Improvement (MWUDs)							
All Species	2	-	20	30	41	58	51
Acres/Structures of Direct Habitat Improvement							
All Species	1360/35	-	2081/79	2081/95	2135/114	2135/137	2192/164
Wildlife User Days (M WUDs)							
Consumptive Species	282	338	282	282	282	282	282
Non-Consumptive Species	282	347	282	322	375	435	504
Total WUDs	564	-	584	634	698	775	837

*** The value for Decades 1-5 is the difference between the increased quantity, in Base Year 1989, and the projected quality water yield by decade. This is not an indicator of decreased water quality, only of the net increase/decrease of water yield.

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M = Thousand MM = Million MMBF = Million Board Feet MMCF = Million Cubic Feet

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WUDs = Wildlife User Days

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VI	Wildlife Habitat Management	114,509
VII	Threatened, Endangered & Selected Sensitive Species	528,129
**VIII	Timber Management	544,220
***IX	Riparian Management	27,775
X	Special Area Management	16,783
XI	Cultural Resource Management	3,570
TOTAL ACRES		**2,121,547**

* Acreage shown includes Wild and Scenic Rivers, Research Natural Areas, and cultural resource areas within Wildernesses.

** Acreage includes both suitable and unsuitable timber lands.

*** All riparian areas would be managed according to this prescription. Acres do not include riparian area acreage in Prescriptions V and VII.

Alternative CBF (Citizens for Better Forestry)

Theme. This alternative was developed in conjunction with the Citizens for Better Forestry, a regional coalition of environmental groups and individuals. The goal of Alternative CBF is to strike a balance between resource use and resource restoration.

Protection of streamsides, fishery restoration, inter-connecting corridors for wildlife, soil conservation, water-associated recreation, wild and scenic rivers, and water quality improvement would be strongly emphasized.

Maintaining priority roadless areas in an undeveloped condition is an important consideration of this alternative.

Special emphasis would be given to the Mt. Shasta area in recognition of its outstanding features and ecological and cultural significance.

Alternative CBF stresses the importance of maintaining habitat for wildlife species dependent upon late seral stages (old-growth).

Timber management objectives in this alternative emphasize harvest systems other than clearcutting. Alternative CBF does not include the use of herbicides. (See the Timber Section in this Alternative).

Refer to **Table II-12** for outputs in this alternative.

Resource Objectives

Air Quality

Protection of air quality would be emphasized in order to retain high quality recreational experiences and reduce carbon dioxide and toxic gas loading of the atmosphere.

This alternative would minimize air quality degradation by reducing slash burning. In regeneration cuts, seedlings would be planted through slash, where feasible. Where burning is required for management activities, such as site preparation, cool burn prescriptions would be used. Slash burning would be done in the spring and fall when the smoke would be dispersed rapidly. Main haul roads and roads near residences or recreation facilities would be surfaced to reduce dust.

Biological Diversity

Biological diversity is often described as "the diversity of life". Ecologists studying the processes of life focus on three levels of biological diversity: genetic, species and ecosystem diversity. The most familiar level, species diversity, involves the number of species in a given area. The Shasta-Trinity National Forests are a remarkably rich biological haven. They harbor hundreds of species of vertebrate animals in addition to many more invertebrate, plant, and other species. Several of these species are rare, threatened, or endangered.

An important but less obvious level of biological diversity is genetic diversity within species. An examination of members of the same species from different parts of their ranges indicates they differ in certain ways. Much of that variation is due to differences in the genes that the individuals inherited from their parents. For example, a red fir growing on the Shasta National Forest is genetically different from the same species growing on the Tahoe National Forest. Similarly, spotted owls in the Shasta-Trinity region are sufficiently different from their counterparts in the Sierra Nevada that ecologists classify these neighboring populations into distinct subspecies.

Finally, there is the aspect of biological diversity in which different physical settings contain distinct communities of species. This is ecosystem diversity. A variety of ecosystems is found within the Shasta-Trinity National Forests. Along the borders of rivers and streams are narrow riparian bands harboring species dependent on readily available water. At the highest elevations of the forests are subalpine communities consisting of species adapted to cold temperatures and high levels of wind and ultraviolet radiation. In the mid-elevations of the mountains is a special and increasingly threatened ecosystem, the old growth forest.

All three levels of biological diversity, singly or together, are constantly changing over time. The natural dynamics and complexity of ecosystems mean that future conditions are not perfectly predictable; events such as fire, drought, wind, floods, and insect or pathogen activity shape ecosystems through space and time. Human activities also play a profound role in shaping ecosystems. The changing ecosystem, in turn, generates changes in species and genetic diversity. This means that the habitat requirements for each organism are constantly changing their position and dimensions on the geographical landscape over time.

One important example of ecological evolution is the development of a snag, its habitat changes, its fall to the ground, and the subsequent changes to the downed log. Finally, the log is incorporated as large, woody material in the soil profile, where special symbiotic mycorrhiza fungi return the mineral nutrients. These nutrients are essential for tree, shrub, or grass growth and survival.

Other important models of ecological evolution, which must be understood for sensitive management of the forest, are: tree growth and seral stage formation and development; species habitat requirements and habitat formation; stream geologic and habitat evolution; riparian formation and development; resource extraction and utilization. The forests, rangelands, meadows, chaparral, riparian areas, and streams are a kaleidoscope of habitat patterns. Collectively, they determine the location and abundance of the species found in the forest at any given time. These resource areas would serve as benchmarks or baselines for the future; understanding the ecological processes affecting them is essential for forest health and resource management.

Alternative CBF would protect genetic diversity by discouraging the fragmentation of old growth forests and by providing protected connective corridors for wildlife to avoid the isolation of species dependent on the old growth habitat. This alternative also emphasizes the natural recovery of fishery stocks.

Species diversity would also be enhanced in Alternative CBF: fisheries habitat would be improved over the first and following decades to improve aquatic diversity; wildlife conditions would be improved by the retention of snags and large dead and downed material and prescribed burns; timber and rangelands would have enhanced habitat patterns because of the mosaics created by prescribed burns.

To provide ecosystem diversity, Alternative CBF would emphasize the protection and improved viability of the late seral/old growth ecosystems. This is accomplished by the management recommendations detailed later in this section for: silvicultural prescriptions, roadless areas and areas left undeveloped in a natural condition, enhanced riparian zones, Research Natural Areas (RNAs), Wild and Scenic Rivers, fuels management, and pest control. Grass and rangelands would be improved by regulating livestock, protecting meadows, and improving range conditions over time.

Biomass

Logging residue that is used for biomass would be generated on approximately 5,900 acres per year in the first decade. Smaller biomass material would be generated from precommercial thinning activities on about 2,500 acres per year. Biomass utilization would be restricted where it would reduce timber productivity because of soil nutrient loss, soil compaction, or loss of soil volume. Large, woody material, such as cull logs and large limbs, would be left in sufficient quantity to provide wildlife habitat and future soil enhancing components.

Botany (Plants)

Alternative CBF would maintain sensitive plant species and their essential micro habitats at levels which assure their long-term viability.

An inventory of all endemic plant species would be performed, including the mapping of their locations. The inventory would also alert project planners so that there would be no negative impacts on the project sites. A management plan would be developed.

The California Natural Diversity Data Base would be used in conjunction with Forest Service data to formulate a sensitive plant list. A comprehensive species management guide would be developed.

Until this guide is developed, sensitive plants would be protected to ensure that they and their surrounding communities remain undisturbed.

No pesticide use or livestock grazing would be allowed within these areas.

Commercial forest foraging would only be done under permit. A survey would be completed by Forest Service personnel to establish the amount and type of forest products to be harvested and the method of harvesting used.

Cultural Resources

Alternative CBF would protect cultural resources by reducing the amount of land subject to ground-disturbing activities (i.e., protection of riparian management zones [RMZs] and wildlife corridors.)

An inventory would be made of likely and known cultural sites. Significant sites would be inventoried by the year 2000. Areas containing less significant sites would be inventoried by 2010. Eligible sites would be nominated for inclusion in the National Register of Historic Places (NRHP). Areas subject to ground-disturbing projects would be surveyed and evaluated before contracts are awarded or activities begin. Identified sites would be protected by project modification or mitigation measures. Access, use, and integrity of sites and locations that are important to traditional Native American religious and cultural practices would be protected, such as Mt. Shasta.

Facilities

Structures. Remote administrative work centers would be maintained, upgraded, or reduced in size on a case-by-case basis. This would be done to meet

management needs in a reasonably safe and cost-effective manner.

To reduce costs, administrative site leases would be eliminated in favor of agency-owned facilities. Possible exceptions would be the public information contact sites (i.e., the south [northbound] arrival station for the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area [NRA]).

Transportation. The Forests' road system would be expanded only to the extent needed to provide for adequate multiple-use management. Many areas designated for timber management would require new road construction. Areas designated for semi-primitive recreation, old-growth-dependent wildlife, or protection of unstable soils would require fewer or no roads. Roads that are deemed unnecessary would be eliminated and the area would be returned to a natural condition.

Road design would give attention to well-engineered stream crossings, prudent road routing, and narrow road widths. High-use, permanent native surface roads would be graveled and/or in-sloped rather than out-sloped. In sensitive wildlife or high erosion areas, where public access is not needed, roads would be closed with gates, berms, or barricades.

Road maintenance would be increased over current levels with particular attention given to stream crossings. Prevention of sidecast material from entering streams and cut bank stabilization would be major goals. Forest road signing and mapping would be upgraded to better aid forest users.

Cost-share agreements with private inholders would continue. They would be augmented, where necessary, to provide equitable financing of road construction and maintenance.

Trails would be maintained and upgraded, where necessary, to provide a safe, comfortable, and aesthetically pleasing experience for trail users. Unmaintained, historic trails would be reopened.

New trails would be provided, as necessary, to enhance recreational opportunities. Trail access would not adversely affect wildlife, fisheries, or wilderness recreational values.

Options would be explored to increase government funding and the volunteer labor force to better provide for trail construction, improvements, and maintenance.

A comprehensive trail condition inventory would address maintenance needs, reconstruction priorities, re-routings away from sensitive areas, and user conflicts. Increased emphasis would be given to new trail construction and reconstruction. A system of trails on Mt. Shasta would provide a recreation opportunity for those unable to climb the mountain or hike at high altitudes.

Fire and Fuels

Alternative CBF would emphasize large-scale fuel reduction to return the forest to more natural conditions and reduce the potential for catastrophic fire. Without an active fuel treatment program, acres burned would be greater than historical averages. This is due to higher fuel loading as a result of other resource needs and historic suppression policies. In areas allocated to Prescription VII (Threatened, Endangered, and Selected Sensitive Species), a fuels management program would be initiated to reduce fuels to avoid loss to catastrophic fire. Prior to burning, hand crews would reduce concentrations of fuels and create shaded fuelbreaks.

Treatment of natural fuels and resource activity-created fuels is projected to be a minimum of 6,000 acres annually during the 1st decade and up to 43,000 acres per year if budget resources are provided. Where feasible, fuels from timber harvesting would be reduced to the level needed for wildlife and watershed and soil protection. Science-based prescriptions would be developed to provide for the biological needs of the site and protection of habitat components.

Protection efforts would be emphasized in high value plantation areas. Flammability reduction would be used to help protect plantations by thinning, pruning and removing flammable material. Utilization of undesirable vegetation would be stressed rather than leaving or treating within areas where timber operations are carried out. A large amount of usable material could be recovered in the form of chips, biomass fuel, poles, and firewood.

Within Wildernesses, the use of planned and unplanned ignitions would be used for prescribed fire. Burn characteristics would approximate those of pristine or near pristine conditions. Mosaic patterns for wildlife and vegetation species diversity would be stressed. Wildfire suppression tactics and strategies would utilize "light hand on the land" as found in National Interagency Fire Line Handbook Forest Service Handbook (FSH) 5109.32a.

Fire suppression would be at the most efficient level as determined by the National Fire Management Analysis System (NFMAS).

Fisheries

Forest-wide and management prescription standards and guidelines, Best Management Practices (BMPs),

RMZs, and supplemental management area direction would be implemented to protect and maintain all fishery resources on the Forests. Habitat surveys and evaluations and the monitoring of timber sales and grazing activities would be accomplished.

This alternative displays the full array of native fisheries management opportunities. Emphasis would be placed on management indicators to meet recreational sportfishing demands. Protecting and improving native fishery habitat capability is a major resource objective. Special protection and management actions would be used to enhance some species.

This alternative would generate a 30 percent increase in habitat capability for anadromous fish (steelhead trout) within four decades. This alternative would generate a 20 percent increase in resident fish habitat capability (rainbow trout) within four decades.

Fish habitat would be improved and watershed restoration activities undertaken. Watershed restoration projects in ephemeral and intermittent streams would be implemented to protect, maintain, and enhance steelhead trout and rainbow trout habitat in downstream perennial stream areas. Direct fish habitat improvement work for steelhead trout and rainbow trout would occur in minor and major perennial streams to accommodate major consumptive sportfishing.

Since the Forests' greatest number of wildlife/fish user days (WFUDs) are associated with the National Recreation Area lakes (Shasta, Trinity, and Lewiston Lakes) and other lakes on the Forests, reservoir habitat management would be emphasized to benefit major consumptive sportfishing for rainbow trout, largemouth bass, as well as native species.

Threatened, Endangered (T&E) and Sensitive

There are no Federally designated threatened and endangered fish species on the Shasta-Trinity National Forests. Special management direction would be undertaken for sensitive species.

Spring-run (Summer) Steelhead and Spring-run Chinook Salmon. Forest-wide and management prescription standards and guidelines, Best Management Practices (BMPs), Riparian Management Zones (RMZs), and supplemental management direction would be implemented to protect and maintain summer steelhead and spring-run chinook salmon habitat.

Spring-run (summer) steelhead and spring-run chinook salmon would receive all possible protection until populations recover. Sport fishing would be discouraged. Forest Service personnel would participate in anti-poaching patrols. Monitoring of all projects would be done to ensure effectiveness of BMPs. Winter logging would be prohibited. Degraded watersheds would not be entered until they had recovered. Recovery would be determined by conformity with the highest possible habitat capability. Emphasis on water quality protection and wild and scenic river designation by this alternative would enhance the opportunity for recovery of these species.

General stream habitat condition surveys and regular sampling of spawning gravels at selected sites would be conducted to provide support information for proposed projects. These surveys would include ongoing monitoring of pools to document changes in pool size, depth, and temperature. Habitat type surveys on the mainstem South Fork Trinity River, the East Fork South Fork Trinity River, upper Hayfork Creek, Rattlesnake Creek, Salt Creek, and other key tributaries within this basin would be done to assess densities of steelhead and salmon juveniles.

Spring-run (summer) steelhead and spring-run chinook salmon adults and out-migrant juveniles would be counted in the mainstem South Fork Trinity River. This information would be correlated with similar data collected from Big French Creek, Canyon Creek, East Fork North Fork Trinity River, New River, and the North Fork Trinity River to provide new baseline data on anadromous fish habitat production potential.

Studies would be developed in cooperation with the California Department of Fish and Game (DFG) and the U.S. Fish and Wildlife Service to access the spawning efficiency/mortality due to habitat conditions (i.e., sedimentation of redds) on the mainstem and South Fork of the Trinity River.

Snorkeling surveys would be conducted in Big French Creek, Canyon Creek, North Fork Trinity River, including the East Fork of North Fork, New River, and the South Fork Trinity River. All feasible fish habitat improvement and watershed restoration projects would be implemented on threatened summer steelhead streams, with the goal of reaching production potentials.

Sedimentation of spawning gravels may be a primary cause of declining salmon populations in the South Fork Trinity River. Monitoring efforts shall include regular sampling of salmon spawning gravels at selected sites, utilizing a McNeil sampler or equivalent accepted technique. This effort is necessary to document changes in spawning gravel quality in the main river where chinook salmon spawn.

Numerous slides along the South Fork Trinity River may be contributing to the sedimentation of spawning gravels. Various slide stabilization techniques should be attempted in order to evaluate efficacy. Successful techniques should be implemented basin wide.

Big French Creek would be assessed to determine its potential for summer steelhead introduction. Any fish introductions would be managed by the DFG.

Bull Trout. Forest-wide and management prescription standards and guidelines, land allocation constraints, BMPs, RMZs, and supplemental management area direction would be implemented to protect and maintain bull trout habitat.

Introduction of the bull trout onto National Forest lands within the McCloud River would be coordinated with the DFG. The McCloud River, above Lake McCloud, would be habitat typed prior to introduction. A monitoring plan would be developed with the DFG to determine the success of introduction, extent of distribution, juvenile density trends, numbers of adults, and habitat preferences, etc. All feasible fish habitat improvement projects would be implemented for bull trout.

Rough Sculpin. Guidelines would be developed to protect and maintain potential rough sculpin habitat during forest operations. Consultation with the DFG would continue. A recovery plan would be prepared for the rough sculpin in conjunction with the DFG detailing areas of expansion in the Pit River system.

Redband Trout. Forest-wide and management prescription standards and guidelines, BMPs, RMZs, and supplemental management area direction would be implemented to protect and maintain redband trout habitat.

The redband trout could sustain an increase in dispersed recreational sportfishing with a major emphasis on a catch-and-release fishery. It would not be managed for major consumptive sportfishing unless an increase in population numbers can be projected to sustain such a fishery.

Trout Creek would be managed as a premiere redband trout stream. All feasible fish habitat improvement and watershed restoration projects would be implemented. The need for further land acquisition in the Trout Creek drainage would be evaluated to ensure a consistent application of beneficial management practices.

Habitat type surveys would be conducted in Edson Creek, Moosehead Creek, Sheepheaven Creek, Swamp Creek, and Tate Creek. All feasible fish habitat improvement and watershed restoration projects would be implemented on redband trout streams. Currently unused habitat in Raccoon Creek would be assessed to determine its potential for redband trout introduction. Any fish introductions would be managed by the DFG. If redband trout are introduced, a monitoring plan would be developed for Raccoon Creek with the DFG. This plan would help determine the success of introduction, extent of distribution, juvenile density trends, numbers of adults, and habitat preferences, etc.

Forest Pests

Integrated Pest Management would be practiced but with some constraints. A range of pest management activities would be available to maintain pest-caused losses at acceptable levels. Emphasis would be placed on prevention. Microhabitats for pest predators would be actively planned for. The intensity and type of pest management activities employed would be determined on a site-specific basis and would be dependent on management goals and resource values affected. The intensity of vegetation management activities would determine which pest management activities are applicable. Most pest management practices would be indirect, and they would attempt to alter pest habitats and encourage natural controls. No chemical or botanical pesticides would be used. Biological pesticides would be used only as a last resort. No pest suppression activities would occur in designated wildernesses. Herbicide use would not be resumed.

Minerals

Surface resources would be protected to the maximum extent possible under existing law. Mineral uses would be discouraged or regulated where they would unreasonably impact other Forest uses.

To avoid conflicts with objectives for the Mt. Shasta Scenic Area, recommendations would be made that no surface occupancy on new leases be allowed above 4,500 feet. Recommendations would be made to the Bureau of Land Management (BLM) for withdrawal from mineral entry on the same area.

Investigations of abandoned chromium, asbestos, and mercury mines would be conducted in the East Fork of the Trinity River Basin to determine if toxics are polluting the watershed and to what extent.

Range

Grazing would be allowed with the following mitigations/restrictions:

Grazing would be managed at approximately 8.3 thousand animal months (M AMs) or in relation to improving and maintaining the productivity and condition of the range, as determined by annual monitoring.

Exclusionary control plots would be established in representative plant communities in selected allotments.

Animals would be allowed to graze in the allotments only at specified times.

Allotment holders would be responsible for animal damage to plantations and for any other substantial resource damage.

Grazing in newly planted areas would be prohibited until the trees reached six feet in height.

Grazing would be monitored in riparian areas to determine if any damage is occurring and what corrective measures should be initiated.

Natural openings and plant communities would be inventoried and any conflicts found between wildlife and cattle would be resolved in favor of wildlife.

Alternative stock watering systems would be developed away from springs and streams with exclusionary fencing installed where necessary.

Private landowners would be given priority on allotments in their areas.

No additional grazing allotments or AMs would be allowed in Wildernesses. Existing allotments would be phased out as they are vacated. Ultimately, the only grazing in Wildernesses would be by pack stock.

The spread of noxious weeds would be controlled by restricting the use of hay unless it is free of weeds and seed.

An annual plan of use would be prepared for each allotment with appropriate environmental documentation and mitigation. Temporary allotments would be terminated.

Recreation

A 'Mt. Shasta National Scenic Area' would be recommended to provide a recreation focus and to recognize and enhance the unique qualities which gained Mt. Shasta its status as a natural landmark. High altitude Shasta red fir, adjacent to the Mt. Shasta Wilderness, would be left intact. Only selection cutting would be allowed at lower altitudes. Visual quality and recreation values would be maintained. Timber management activities, which are specifically designated to complement this focus, would be allowed.

A Protection Plan would be developed to emphasize the recreation values of the Lower McCloud River and Squaw Valley Creek Canyons. This would be done by using a mix of management prescriptions that provide primitive and developed recreation opportunities, as well as older over-mature habitat dependent species and protection of the unique McCloud wild trout fishery. Timber management opportunities would occur around the periphery of these areas, and they would be compatible with the recreational focus in the heart of the area.

The Trinity Divide Biolink would link the Klamath Province with the Sierra Nevada Province through the Mt. Eddy further planning area and Castle Crags State Park. This would be done to enhance recreation opportunities and wildlife values.

Interpretive services and 50 percent of the campgrounds would be operated at the standard service level. Campgrounds would be kept open during the primary use season (Memorial Day through Labor Day). Substandard developed recreation sites would be rehabilitated at the rate of 275 PAOT (people-at-one-time capacity) per decade. The rehabilitation program would be focused on areas most heavily used or with the highest potential level of use.

New construction would be focused on facilities that meet future demand and inform the public of recreation opportunities. New campgrounds would serve 500 PAOT each in decades 1 and 2.

A well distributed trail network would be developed and maintained across the Forests. Reconstruction would take place on 50 miles per decade (five miles per year). One trailhead would be constructed or rehabilitated per year.

About 185 miles would be designated as off-highway vehicle (OHV) travelways by the end of the fifth decade. These travelways would be open to all OHVs in clearly marked, designated areas consistent with the protection of other resource uses.

Fifty percent of the dispersed recreation sites would be managed at the standard service level, and 50 percent would be at the low standard level. Serious health and safety deficiencies would be corrected. Monitoring of primitive recreation needs would be implemented for future planning needs.

North state skiing needs and sites would be assessed.

Riparian Areas

A high level of protection would be provided/emphasized for riparian ecosystems through the adoption of standards and guidelines and special management direction.

RMZ standards and guidelines would be amended to provide for additional monitoring and protection. See the proposed Forest Plan, Chapter 4, Management Prescription IX (Riparian Management).

This alternative would also adopt the standards and guidelines and management direction found in **Exhibit 1** on the next page.

Resource managers would use the most protective standards and guidelines, directions or goals whenever a conflict appears between the Forest-wide Standards and Guidelines and those found in **Exhibit 1.**

Soils

Protection of soils would be a primary objective of this alternative. Soil organic material and a complete duff layer would be maintained to provide long-term soil productivity of timber and range lands.

Logging on wet soils would be prohibited. Lopping and scattering of slash and planting through slash would be required to protect soil nutrients. Large, woody debris and slash would be left on the ground to provide the long-term soil organic materials needed to maintain soil moisture and microbial activity. Hardwood and brush components would be retained to provide nutrient cycling.

Areas with high or extreme soil erosion hazard ratings would be closed to OHV use. Grazing would be restricted on areas where monitoring demonstrates negative impacts to soils. Management activities would be excluded from areas of high instability such as inner gorges. (See the discussion on soils in the Special Areas section).

Special Areas

Research Natural Areas (RNAs). This alternative would allocate 26,970 acres of National Forest lands to RNAs. Under this alternative, 13 areas would be proposed for immediate establishment. See **Table IV-8** in Chapter IV for a listing of these areas.

In addition, a 500-acre triad grove west of the Burnt Lava Flow would be evaluated for an eastside pine type. This is an undisturbed watershed representative of adjacent watersheds. This area would be used for comparative studies similiar to the Nature Conservancy studies in the McCloud contiguous area.

Consideration for RNA establishment would be given to aquatic, hydrologic, geologic, soils, and high-priority unique plant, animal, and natural communities. The Rough Gulch watershed and the South Fork Trinity, between Rough Gulch and Smoky Creek, would be recommended for hydrologic RNA designation.

High-priority California Natural Diversity Data Base sites, not subject to adequate protection by other means, would also be recommended for RNA designation.

A Level 3 soils inventory would be initiated for sensitive soils to identify potential soils-based RNA candidates. Bear Creek would be recommended for RNA designation for dioritic soils (highly-erodible and representative of significant portions of the Trinity National Forest).

No grazing would be allowed in RNAs unless specifically required to maintain the targeted element.

Special Interest Areas (SIAs). Fifteen areas, totaling 3,812(+) acres, would be recommended for SIA designation under this alternative. Following is a listing of those areas: (1) Blake Mountain, (2) Cable Creek, (3) Deep Crater, (4) Giant Crater Lava Tube System, (5) Little Glass Mountain, (6) Lower McCloud River Wild Trout Area, (7) Mt. Shasta Scenic area, (8) Natural Bridge, (9) Paint Pot Crater, (10) Pumice Stone Mountain, (11) Samwel Cave, (12) Spatter Cones, (13) Tedoc Mountain, (14) Trout Creek Redband Trout Area, and (15) Western Azalea. See **Table IV-10** in Chapter IV.

Timber

This alternative would result in an average annual allowable sale quantity (ASQ) of 65.3 million board feet (MMBF) in the first decade from a suitable timber land base of about 495,400 acres (30 MMBF from the Shasta Forest and 35 MMBF from the Trinity Forest).

On approximately 372,700 acres suitable for timber production, timber management activities would be relatively intensive and yields would be moderate to high. Impacts to wildlife would be minimized by the interspersion of riparian zones and other lands where little or no harvesting would occur. Large, woody material, such as cull logs and large limbs, would be left in sufficient quantity to provide wildlife habitat and future soil enhancing components. Wildlife would benefit from the hardwoods and snags that would be left.

In scenic view areas and special wildlife areas, timber management would be modified to protect visual quality and/or enhance specific wildlife habitat. On about 122,700 suitable acres, timber management would be minimal in order to emphasize other resource uses, such as recreation, or because of site limitations which preclude intensive timber management.

An additional 582,400 suitable acres would not be available for timber management, because they are allocated to other uses, such as old-growth wildlife habitat,

Exhibit 1
Standards and Guidelines for the Two Watershed and Fish Options

Option	Description
Current Option	Riparian standards and guidelines and Best Management Practices (BMPs) to minimize cumulative effects in watersheds, as defined in current Forest Service (FS) and Bureau of Land Management (BLM) Plans.
Watershed and Fish Habitat Emphasis Option	**Reserve areas:** Wilderness, National Parks, Wild and Scenic Rivers, LS/OG1, and owl additions. **Riparian management areas on all FS and BLM lands:** (1) Wild, Scenic, and Recreational rivers designated or under study: no-harvest area 1/4 mile on each side of the stream or the width of the 100-year flood plain, whichever is larger, where quality, fish or other ecological values are described as part of the stream's outstandingly remarkable features. (2) No-harvest area 1/8 mile of each side of the stream or the width of the 100-year flood plain, whichever is larger, on major streams draining at least 30 square miles. (3) Fish-bearing streams: 300-foot no-harvest area on each side of stream. (4) Permanently flowing non-fish-bearing streams: 150-foot no-harvest area on each side of stream. (5) Seasonally flowing or intermittent streams: 50-foot no-harvest area on each side of streams in areas of moderate and high soil instability. No harvest areas will vary with topographic and on-site conditions, but the horizontal width of such areas, implemented in practice, should reach the objectives expressed as averages here. **Key watersheds identified as having high-quality fisheries, water or ecological values** *(Appendix D)*: Augment the Forest Plan standards and guidelines with the 50-11-40 rule and rotations approaching 200 years (management option C as described in "Lands Outside of Reserves," under "Forest Management"). **Forest road systems and related road-drainage problems:** (1) *Reduce and minimize forest road-system mileage:* (a) Minimize construction of new roads, and construct no new roads in current roadless areas identified in the Forest Plans. (b) Remove (return to a natural condition) spur roads and other non-essential roads. (2) Conduct a forest road-system analysis by National Forest and BLM District to identify road locations and practices which will reduce impacts to riparian areas of existing and new roads.

Exhibit 1 (continued)
Standards and Guidelines for the Two Watershed and Fish Options

Option	Description
	(3) *Road drainage:* (a) Increase maintenance of road network during the rainy season. (b) Upgrade culverts to larger sizes on existing and planned roads. (c) Increase frequency of culverts on new and existing roads. **Logging slash treatment/prescribed fire:** (1) Eliminate hot burns on steep grounds. (2) Eliminate burns in riparian management areas. **Livestock grazing:** Include temporary and permanent exclusion from riparian areas to promote the reestablishment of shrubs, hardwoods, and fringe wetlands, and maintenance of stream-bank integrity. **Riparian and fish-habitat restoration:** Establish a program that will ensure long-term stream-habitat stability. **Cumulative effects:** Conduct an analysis by National Forest and BLM District to aid in the timing and location of timber harvest and location of roads and landings.

recreation, ecosystem research, threatened, endangered and sensitive plant or animal protection, or watershed protection. These uses preclude timber harvesting on a regular basis.

Selection and green tree retention would be the main harvesting systems used. An estimation of the average annual acres and volume harvested in the first decade is shown in **Table II-11.**

The timber on suitable lands would be managed on a minimum 120 year rotation. This timber harvest schedule would result in about 11.9 percent of the suitable acres being treated in the first decade. About 8.3 percent of the suitable acres would be regenerated in the first decade.

No clearcutting would be used in this alternative. Emphasis would be placed on the uneven-aged selection system including single tree and group selection. This system would be applied, where feasible, on slopes less

Table II-11
Timber Cutting Methods (Alternative CBF)

	Acreage		Volume	
Cutting Method	Acres	Percent	MMBF	Percent
Clearcut	0	0	0	0
Green Tree Retention*	2,690	45	43	66
Selection	1,400	24	13	20
Commercial Thinning	1,040	18	6	9
Salvage	750	13	3	5
Totals	**5,880**	100	**65**	**100**

* Includes Shelterwood Cuts.

than 40 percent. Uneven-aged selection would be the predominant system on low site class lands and areas where high visual quality is to be maintained. Openings would be two acres or less.

The green tree retention system would be the dominant system used on slopes greater than 40 percent. Harvest units would be limited to less than 20 acres in size. In addition to saving as much of the existing understory as possible, 12 of the larger trees would be saved on each acre of well stocked stands, and 6 trees per acre on understocked stands, if available. A maximum of 70 percent of the merchantable volume per acre would be removed under this system. Where possible, these units would be long narrow strips to maximize edge and inseeding of natural regeneration.

Commercial thinnings would be accomplished in overstocked stands to a minimum of 11 inches diameter-at-breast height (DBH) and 40 percent crown closure.

Stand maintenance (salvage) would be practiced extensively to capture commercially valuable dead or dying trees.

The harvesting systems would use minimal site preparation by burning. Large slash, in excess of Minimum Management Requirements (MMRs), would generally be used for firewood, chips, or fuelwood for biomass power plants. Small slash would be left on site.

This alternative would result in an average of 3,000 acres of reforestation per year in the first decade. A combination of artificial and natural regeneration would be used. Planting would be done with a species mix to perpetuate the variety of conifer species found growing on the site.

The timber harvest schedule for this alternative would result in an average annual net growth of about 101 MMBF, by the fifth decade, on the suitable lands. This growth represents an average of about 205 board feet per acre per year.

No herbicides would be used. Where needed, non-chemical, manual means of vegetation management would be used. Vegetation management (non-chemical release) would occur on about 3,700 acres per year, primarily on lands where timber growth and yield are emphasized.

On suitable timber lands, hardwoods would be managed for wood products, while providing for wildlife habitat needs. Those hardwoods cut during logging operations would be yarded to landings for use as firewood or as biomass for power plants (see Biomass section). Pure hardwood stands would not be converted to conifers, but they may be managed for wood production on a sustained yield basis. Fuelwood management zones would be identified around population centers, and hardwoods would be managed within these zones to provide continuing supplies of firewood for home use.

Visual Quality

Visual quality would be emphasized in the NRA, on Mt. Shasta, in the McCloud River area and within the Trinity Divide Biolink area. It would also be emphasized around most developed recreation sites. An expanded Wild and Scenic Rivers system, along with wider RMZs on other waterways, would be managed to provide protection for visual quality.

About three quarters of the Forests (i.e., Wildernesses and other reserve areas) would be managed to preserve the characteristic landscape. Visual quality would also be an important consideration within roadless areas assigned semi-primitive prescriptions. Management activities would be evident along proposed State scenic highways, but visual quality objectives would not fall below "partial retention". (See Chapter III, Visual Quality, **Figure III-6**, Visual Quality Objectives [VQOs]).

In the remainder of the Forests, timber management activities would not cause the visual quality objective to fall below "modification" (see Chapter III, Visual Quality, **Figure III-6**, VQOs). However, higher road densities would be required to carry out the timber prescriptions in this alternative.

The visual character of the Forests would change to more diversity, slightly more old-growth, and smaller diameter trees. Overall, this alternative would provide a high degree of emphasis on visual quality.

Water

Maintaining water quality would be highly emphasized in this alternative. Riparian Management Standards and Guidelines, Best Management Practicies (BMPs), and Riparian Management Zones (RMZs) would be applied to Forest activities that would affect water quality.

Watersheds in a degraded condition would be improved by the year 2000. Non use of herbicides would significantly reduce the risk of water contamination from chemical sources.

No specific management objectives would be planned for the purpose of changing water yields. Outstanding resource waters would have no degradation.

Wild and Scenic Rivers

This alternative would include 106.4 miles (National Forest land only) of Wild, Scenic, and Recreation Rivers including New River, the North Fork Trinity River, the South Fork Trinity River, and the mainstem Trinity River. These would be supplemented by an additional 116.6 miles (National Forest land only) and 72.6 miles (private land) recommended for designation: Beegum Creek, Canyon Creek, a portion of Hayfork Creek, the upper and lower segments of the McCloud River, the upper segments of the North Fork and South Fork Trinity River, the Sacramento River, Squaw Valley Creek, and Virgin Creek. (See the Wild and Scenic Rivers write-up, DEIS IV).

Action on the McCloud and Sacramento Rivers would be coordinated with the State of California due to the amount of private land involved. Complete descriptions of these rivers are presented in Appendix E.

In response to public input and regional direction (Regional Forester Paul Barker's direction of 9/26/90), the Forest shall conduct a forest-wide assessment of other potential Wild and Scenic River candidates, including the East Fork Trinity River.

Wilderness and Roadless Areas

Existing Wildernesses would be maintained under this alternative. Acreage shown is National Forest land only.

Wilderness	Acres
Castle Crags	10,483
Chanchelulla	7,800
Mt. Shasta	38,560
Trinity Alps	405,128
Yolla Bolly-Middle Eel	36,805

A total of 498,776 acres of the Shasta-Trinity National Forests would be managed as part of the National Wilderness Preservation System. In addition, the 7,720 acre Mt. Eddy Roadless Area would be recommended for Wilderness designation.

Pest management suppression would not be conducted within Wilderness area boundaries.

No feed for grazing cattle would be carried into, or distributed in, any Wilderness.

Management plans would be written to address concerns including: over-use; party size; stock numbers; trailhead quotas; visitor education; campsite condition; trail condition; limits of acceptable change (LOC); monitoring; fire; cultural resources; species re-introduction; and wilderness grazing.

Wilderness patrol programs would be established.

No new grazing allotments would be established. Unused or vacated grazing permits would be retired.

Fifteen released roadless areas would remain roadless. These are:

Trinity Forest	Shasta Forest
Chinquapin	Castle Crags B
East Beegum	Devils Rock
East Fork	Mt. Shasta B
Fisher Gulch (in part)	West Girard
Little French Creek	East Girard
Pattison	(Nature Conservancy
Penney Ridge	portion)
South Fork	
Underwood	
West Beegum	

Wildlife

Wildlife management objectives would maintain habitat to support all species on the Forests at or above viable population levels. The distribution and variety of wildlife habitat would be maintained.

Management indicators (i.e., deer, bear, gray squirrel, and pileated woodpecker) would be managed to at least the moderate level identified in the habitat capability models. While accountability is on a Forest-wide basis, objectives would be measured at the compartment level.

Forest Standards and Guidelines pertaining to special habitat components (i.e., snags, hardwoods, dead and down material, seral stages, etc.) would set the minimum level of management throughout the Forests. Snags and dead and down materials would be managed to the same level as in Alternative PRF except in Prescription VI as described in this section.

Hardwood forest types would be managed primarily for the benefit of deer, bear and gray squirrel but would not be managed for conversion to conifers.

In the 1st decade, the average direct habitat improvement would be done annually on 4,962 acres to benefit deer and other wildlife species.

Prescription VI, Wildlife Management, includes designated wildlife areas for black bear, deer and gray squirrel.

These species would receive a higher level of emphasis in this prescription than in other areas of the Forests. Areas within Prescription VI would be managed to "high" capability model standards. Included are deer winter ranges, six black bear areas, and 5,000 to 6,000 acres of bitterbrush. About 209,500 acres are allocated to Prescription VI in this alternative.

On Prescription VI lands an average of 3.5 snags per acre would be maintained; 75 percent of these would be hard snags.

Timber management activities would be permitted to enhance habitat on Prescription VI lands. Road densities would not exceed an average of 1.5 miles per square mile.

On lands identified as deer transition and winter ranges, an average of 46 square feet of hardwoods per acre would be maintained. On the remaining areas, an average of 30 square feet/acre basal area (the equivalent of 10, 24-inch diameter trees per acre) of hardwoods would be maintained. If less than 30 square feet basal area is present naturally, the existing level of hardwoods would be maintained.

This alternative emphasizes maintaining biotic diversity of plant and animal life native to the area. Special emphasis would be given to retention of older over-mature habitats. A diverse and well-distributed landscape pattern would be created and maintained. Monitoring would be conducted annually on a compartment level using management indicators. This list would include guilds from each of the major wildlife groups, (granivores, detritivores, folivores, herbivores, fungivores and carnivores) and guilds specializing in each of the wildlife habitat relationship (WHR) special habitat components.

Wildlife Corridors

Trinity Forest - A system of 1,200 foot wide corridors would be established to interconnect Prescription I (Unroaded Non-Motorized Recreation, V (Wilderness Management), VI (Wildlife Habitat Management), and VII (Threatened, Endangered and Selected Sensitive Species). These corridors would be managed as Prescription VII.

Shasta Forest - A system of variable width corridors would be established to interconnect Prescription I (Unroaded Non-Motorized Recreation), II (Limited Roaded Motorized Recreation), V (Wilderness Management), VI (Wildlife Habitat Management), VII (Threatened, Endangered, and Selected Sensitive Species), and X (Special Area Management). These corridors would be managed as Prescription VII.

Under this alternative, corridor widths would be based on their relationship to the management of all other elements of the Forests. No pesticide use, timber harvesting, or grazing would occur within territories or corridors. Unused or vacated grazing allotments would be closed.

WILDLIFE - Threatened, Endangered, and Sensitive Species

All known or future sites of Federally listed threatened or endangered (T&E) species or Regional Forester identified sensitive species would be fully protected and managed according to the Recovery Plan and/or habitat requirements for each species.

Threatened

Spotted Owl. The Forests would provide habitat conservation areas (HCAs) and other measures as designated by the Interagency Scientific Committee (ISC) Report or as defined by the Recovery Plan, whichever is more restrictive. This system would be adjusted as more definitive scientific information becomes available.

Marbled Murrelet. On September 28, 1992, the U.S. Fish and Wildlife Service (USFWS) listed the marbled murrelet population in Oregon, Washington, and California as a threatened species under the Endangered Species Act. The Forest Service is consulting with the USFWS on all activities that may affect the marbled murrelet. Recovery requirements for the marbled murrelet are not yet known, but they will be incorporated into the Final Land and Resource Management Plan. No activity will occur in marbled murrelet habitat until their requirements are known.

Endangered

Bald Eagle. All known bald eagle nesting territories would be managed according to direction provided in the Pacific Bald Eagle Recovery Plan (1986) and models developed for the Wildlife Habitat Relationship Program (WHRP). This plan calls for managing 20 pairs of bald eagles. Newly found nests would receive similar treatment.

Peregrine Falcon. Peregrine falcon nesting territories would be protected and managed according to the Recovery Plan for Peregrine Falcon - Pacific Population (1982) and models developed for WHRP. This plan calls for managing 6 pairs of peregrine falcons. Newly found nests would receive similar treatment.

No timber harvest or pesticide use would occur within bald eagle or peregrine falcon territories.

Sensitive

Fisher and Pine Marten. By the end of the fifth decade approximately 749,000 acres of fisher and 549,000 acres of pine marten habitat would exist on the Forests. Some of this habitat would remain in relatively large contiguous blocks within areas allocated to no scheduled timber harvest (e.g. wildernesses, research natural areas, wild rivers). Forty-four percent of the Forests would be in a near natural condition. In order to provide links and travel corridors within and between habitat segments, Alternative CBF would include 214,000 acres of land adjacent to perennial and intermittent stream courses (riparian management zones). Two fisher habitat areas and 12 pine marten habitat areas would be established and managed as Prescription VII.

Red fir is an important vegetation type for the pine marten. By decade five approximately 85,900 acres of red fir would remain in a near natural condition.

Goshawk. Alternative CBF would manage 190 territories at a minimum of 150 acres each.

Other - Wolverine. Wolverine is a state threatened species whose populations and habitats would be inventoried, in cooperation with the DFG, in order to develop a wolverine management plan.

Environment to be Created

By the year 2040, about 80 percent of the Forests would remain in a fairly natural condition. This percentage would be in relatively large, contiguous blocks including six wildernesses, 13 research natural areas (RNAs), 15 Special Interest Areas (SIAs), 10 Wild and Scenic Rivers, habitat conservation areas (HCAs), and wide corridors for older over-mature dependent species.

Areas managed for their riparian values would also contribute to a naturally appearing landscape along perennial and intermittent streams, in fairly large, wide strips of land. Fifteen of the 29 former roadless areas would be undisturbed. The 7,720 acre Mt. Eddy Further Planning Area would be recommended for Wilderness designation.

Areas seen from State highways, county roads, forest roads with high recreation use, and recreation sites would remain relatively unchanged. Forest activities would not be evident in areas with distinctive landscapes.

On the remaining areas of the Forests, forest management activities would be evident. These areas would be modified to varying degrees by activities such as timber harvesting, road construction, developed recreation areas, and mining.

In 50 years, about 10 percent of the Forests would consist of stands which are less than 50 years of age. These regenerated stands would generally consist of a mosaic of even-aged and uneven-aged stands less than five acres in size.

Wildlife habitat would be more diverse than it is today, with less habitat in the early seral stages, about the same amounts in the mid-seral stages, and more habitat in the late seral stages. Approximately 370,000 acres of old growth habitat would remain.

Table II-12
Average Annual Outputs by Decade - Alternative CBF*

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Economics							
Total Budget (MM$)	40	-	38.1	39.1	40.0	41.8	44.1
Total Cost (MM$)	44	-	51.7	52.8	53.6	55.5	57.8
Facilities							
Transportation							
Trail Construction/Reconstruction (miles)	0/1	-	5/5	5/5	5/5	5/5	5/5
Road Construction (miles)	63	-	15	7	7	5	5
Road Reconstruction (miles)	73	-	16	17	16	17	17
Road Maintenance (miles)	6,550	-	6,500	6,570	6,440	6,690	6,740
Dams and Reservoirs (number)							
Forest Service	2	-	2	2	2	2	2
Other Federal	3	-	3	3	3	3	3
Other State/Local	1	-	1	1	1	1	1
Private	10	-	10	10	10	10	10
Administrative Sites (number)							
Forest Service Owned	24	-	26	26	26	26	26
Leased	2	-	0	0	0	0	0
Fire and Fuels							
Total Fuel Treatment (acres)	6,300	-	5,880	5,940	5,960	5,980	5,980
Fire-Related Treatment	1,500	-	1,500	1,500	1,500	1,500	1,500
Timber-Related Fuel Treatment	4,500	-	4,000	4,000	4,000	4,000	4,000
Other Fuel Treatment (for wildlife)	300	-	380	440	460	480	480
Expected Acres Burned by Wildfire			11,000	11,000	11,000	11,000	11,000
Intensity Class 1	32	-	55	55	55	55	55
Intensity Class 2	48	-	154	154	154	154	154
Intensity Class 3	774	-	330	330	330	330	330
Intensity Class 4	850	-	451	451	451	451	451
Intensity Class 5	3,345	-	4,686	4686	4,686	4,686	4,686
Intensity Class 6	1,350	-	5,324	5324	5,324	5,324	5,324
Fish							
Inland Fish Other Than T&E							
(M Pounds)	1,424	1,794	1,713	1,713	1,770	1,837	1,837
Anadromous Fish							
Commercial (M Pounds)	363	457	691	691	691	691	691
Sport (M Pounds)	113	142	353	353	353	353	353

* See the last page of this table for abbreviated terms and meanings.

** A base year of 1989 and the 1990 RPA program were used as instructed by the Regional Guide for the Pacific Southwest Region; revised 1990.

Table II-12
(Continued)

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Fish (Continued)							
Direct Habitat Improvement							
Acres/Structures							
Inland Fish	15/25	-	39/82	39/82	39/82	39/82	39/82
Anadromous Fish (Commercial)	0/0	-	0/0	0/0	0/0	0/0	0/0
Anadromous Fish (Sport)	5/50	-	30/64	30/64	30/64	30/64	30/64
Thousand Fish User Days (MFUDs)							
Inland Fish	356	-	388	388	400	412	412
Anadromous Fish (Sport)	40	-	85	85	100	115	115
Human Resources							
Programs (Enrollees)	50	-	50	50	50	50	50
Lands and Minerals							
Land Acquisition (Acres)	6,996	-	1,500	1,500	1,500	1,500	1,500
Minerals (Operating Plans)	122	146	85	85	85	85	85
Range							
Grazing (M AMs)	12	12	8.3	8.3	8.3	8.3	8.3
Recreation							
Developed Public (MM RVDs)	.71		0.75	0.86	0.97	1.09	1.2
Developed Private (MM RVDs)	.49		0.51	0.59	0.68	0.75	0.83
Dispersed (MM RVDs)	2.56	*	2.76	3.2	3.7	4.3	5.0
Wilderness (MM RVDs)	.13		0.14	0.16	0.19	0.22	0.25
Open, Usable OHV Areas-Summer (Acres)	239.2	-	220195	220195	220195	220195	220195
Open, Usable OHV Areas-Winter (Acres)	176.2	-	98750	98750	98750	98750	98750
Roads and Trails							
Open Only to OHV Use-Summer (Miles)	0	-	0	0	0	0	0
Open Only to OHV Use-Winter (Miles)	0	-	0	0	0	0	0
Closed to OHV Use-Summer (Miles)	810	-	810	810	810	810	810
Closed to OHV Use-Winter (Miles)	815	-	815	815	815	815	815
Timber							
Allowable Sale Quantity (MMCF)	28	-	9.8	9.8	9.8	10.0	10.2
Allowable Sale Quantity (MMBF)	184	-	65.3	65.3	65.3	66.4	68.1
Long Term Sustained Yield (MMCF)	-	-	11.3	11.3	11.3	11.3	11.3
Long Term Sustained Yield (MMBF)	-	-	75.3	75.3	75.3	75.3	75.3
Reforestation (Acres)	9,400	8,084	3,000	3,000	3,000	3,000	3,000
Timber Stand Improvement (Acres)	7,800	-	6,200	6,200	6,200	6,200	6,200

Table II-12 (Continued)

Resource Element	Base Year** 1989	'90 RPA Goals** 1	DECADE 1	2	3	4	5
Timber (Continued)							
Wood Products Other Than Sawtimber							
Firewood (M Cords)	21	-	25	30	30	30	30
Visual Quality							
Visual Quality Index	127.3	-	127.4	130.1	128.1	128.1	128.1
Water							
Quality (M Acre feet at standard)	5,448	-	5,437	5,437	5,436	5,435	5,435
Increased Quantity (M acre feet)***	5,450	-	-13	-13	-14	-15	-15
Watershed Improvement (Acres)	399	706	300	300	300	300	300
Wildlife							
Threatened, Endangered and Sensitive Species (TE&S)							
Bald Eagle (# managed pairs)	25	-	32	35	35	35	35
Goshawk (# pairs)	150	-	150	150	150	150	150
Peregrine Falcon (# managed pairs)	6	-	9	14	14	14	14
Spotted Owl (# pairs)	97	-	185	195	210	210	210
Other Than TE&S							
Deer (M animals)	62	-	62	62	62	62	62
Direct Habitat Improvement (MWUDs)							
All Species	2	-	35	51	58	67	61
Acres/Structures of Direct Habitat Improvement							
All Species	1360/35	-	4962/143	4962/172	5060/206	5060/247	5163/296
Wildlife User Days (All Species) M WUDs							
Consumptive Species	282	338	282	282	282	282	282
Non-Consumptive Species	282	347	282	322	375	435	504
Total WUDs	564	-	599	655	715	784	847

*** The value for Decades 1-5 is the difference between the increased quantity, in Base Year 1989, and the projected quality water yield by decade. This is not an indicator of decreased water quality, only of the net increase/decrease of water yield.

Abbreviated Terms and Meanings for this Table.

M = Thousand MM = Million MMBF = Million Board Feet MMCF = Million Cubic Feet

OHV = Off-Highway Vehicle AMs = Animal Months

RVDs = Recreation Visitor Days

TE&S = Threatened, Endangered & Sensitive

WUDs = Wildlife User Days

	Management Prescription	Acres
I	Unroaded Non-Motorized Recreation	120,630
II	Limited Roaded Motorized Recreation	6,589
III	Roaded Recreation	245,486
IV	Roaded, High Density Recreation	6,290
*V	Wilderness Management	506,496
VI	Wildlife Habitat Management	207,116
VII	Threatened, Endangered and Selected Sensitive Species	625,896
**VIII	Timber Management	341,703
***IX	Riparian Management	27,775
X	Special Area Management	29,996
XI	Cultural Resource Management	3,570
TOTAL ACRES		**2,121,547**

* Acreage shown includes Wild and Scenic Rivers, Research Natural Areas, and cultural resource areas within Wildernesses.

** Acreage includes both suitable and unsuitable timber lands.

*** All riparian areas would be managed according to this prescription. Acres do not include riparian area acreage in Prescriptions V and VII.

Comparison of Alternatives

F

This section expands on the preceding portion of this chapter. It displays the range of differences exhibited by the alternatives considered, and it describes the major changes that would be expected as a result of their implementation. The alternatives considered by Shasta-Trinity National Forests personnel are compared in five ways:

1. Variations in the acreages assigned to the different management prescriptions;

2. Differences in physical outputs and activities of major elements and resources;

3. Differences in economic efficiencies between alternatives based on present net value (PNV) with consideration for net public benefits (NPB);

4. Differences in major environmental consequences resulting from land allocations and management activities; and

5. Differences in the ways each alternative responds to major public issues.

There is a major comparison between alternatives that is pertinent to understanding the relative affects of all four alternatives in detail. That comparison is with Alternative CUR, as described in the 1990 Draft EIS, which reflects recent, historical levels of commodity related outputs.

Since the 1990 Draft EIS, several decisions have been made which, in turn, have caused significant changes in the four alternatives when compared to the 1990 CUR Alternative. Those decisions include: (1) the listing of the spotted owl; (2) an emphasis on old-growth and its related species; and (3) the adoption of riparian standards and guidelines that provide for riparian values. These changes result in far greater effects (positive and negative) when comparing the alternatives to the 1990 CUR Alternative than the difference in effects between any of the alternatives in this document.

In this section and in Chapter IV, the environmental consequences are described for the four alternatives considered in detail. Those consequences vary, but all alternatives generally have positive affects on those consequences relating to the biological and physical environment. On the other hand, there are adverse affects on those consequences relating to local economies dependent on timber harvest when compared to the 1990 Draft EIS, Alternative CUR.

Table II-16 displays the 1st and 5th decade outputs from the alternatives considered in detail and Alternative CUR in the 1990 Draft EIS.

Land Allocation Comparisons

Differences in land allocations among the alternatives considered in detail are displayed in **Table II-14**. The number of acres allocated to management prescriptions within each alternative is also shown. Since each prescription contains a different set of practices and activities which focus on varying levels or intensities of resource use, the number of acres within each prescription is indicative of the relative emphasis under the different alternatives.

Following is a brief discussion of the differences between management prescriptions:

I - Unroaded Non-Motorized Recreation. This prescription includes former RARE II roadless areas. Also included are wild segments of Wild and Scenic Rivers outside of wildernesses. These areas would be managed primarily for primitive, dispersed recreation and visual quality; they would be left undeveloped and roadless. Alternatives PRF and CBF, with a high emphasis on amenity and non-market values, have the most acres in this prescription.

II - Limited Roaded Motorized Recreation. This prescription includes portions of former RARE II roadless areas, high elevation areas with low road densities, areas in and around the Whiskeytown-Shasta-Trinity National Recreation Area (NRA), and scenic segments of the Wild and Scenic Rivers. These areas would be managed primarily for dispersed recreation with limited motorized use.

III - Roaded Recreation. This is the primary prescription for the NRA, recreation segments of Wild and Scenic Rivers, and areas to be managed to a high visual quality. Alternatives PRF and CUR have the most acres in this prescription because of their emphasis on visual quality. These alternatives also allow other management practices along most visually sensitive roads on the Forests.

IV - Roaded, High Density Recreation. Developed sites and high-use dispersed recreation areas are included in this prescription. Acreage does not vary significantly between alternatives.

V - Wilderness Management. This prescription includes the five designated Wildernesses. It also includes the Mt. Eddy further planning area in Alternative CBF.

VI - Wildlife Habitat Management. This prescription includes areas managed primarily for consumptive wildlife species, such as deer and bear. It includes habitat

areas such as key deer winter range and bitterbrush areas. Alternatives PRF and CBF, with a high emphasis on these species, have the most acreage in this prescription.

VII - Threatened, Endangered, and Selected Sensitive Species. Habitats to be managed for these plant, fish, and wildlife species are included. The major acreage differences between alternatives is the additional T&E habitat allocated for furbearers in Alternative CBF.

VIII - Timber Management. This prescription includes suitable timber lands where timber would be managed to produce moderate to high yields. Acreages include small inclusions of unsuitable timber lands within suitable areas. Those alternatives which place the greatest emphasis on timber management (Alternatives RPA and CUR) have the most acreage in this prescription.

IX - Riparian Management. This prescription includes Riparian Management Zones (RMZs) in and around perennial (Class 1 and 2) streams (including inner gorges), sensitive intermittent and ephemeral (Class 3 and 4) streams, and lakes and reservoirs. Acreages shown in **Table II-14** are estimates. Acreages are not shown on the alternative maps because many riparian areas are included in more restrictive prescriptions such as I,V, VII, or X. Prescription IX applies to all areas where riparian characteristics are found, not just mapped areas (see the proposed Forest Plan, Chapter 4, Management Prescription IX). For these reasons any display of acres in this prescription could create an impression that riparian values were being emphasized in one alternative over another. The riparian standards and guidelines have been applied equally to all alternatives.

X - Special Area Management. This prescription includes areas recommended for Research Natural Area (RNA) and Special Interest Area (SIA) establishment. Acreages shown do not include RNAs within wildernesses.

XI - Cultural Resource Management. This prescription includes significant cultural sites which are eligible for inclusion in the National Register of Historic Places as well as traditional Native American sites. The acreage within this prescription does not vary by alternative.

Output/Activity Comparisons

The most quantified and specific figures for comparing the alternatives are provided in **Table II-16**. These resource-specific outputs and activities reflect the themes and objectives for each of the alternatives examined in detail. For example, the degree to which the Forest would be used for grazing under each alternative is measured in animal months (AMs). **Table II-16** shows the variation in such grazing use from one alternative to another. Additional comparisons by alternatives are shown in **Table II-17.**

Resource Objectives

Air Quality

State standards would be met in all alternatives.

Biomass

The amount of biomass material available for use would be largely dependent upon the number of acres harvested. Therefore, Alternatives RPA and CUR, with high harvest levels, would generate more biomass material than alternatives with low harvest levels, such as Alternative CBF.

Around population centers, biomass would be managed primarily for firewood in all alternatives. Hardwoods would be managed to provide continuing supplies of firewood for home use.

Biological Diversity

All alternatives would meet the diversity standards and guidelines which provide for the components of biological diversity. In terms of richness the standards and guidelines for snag densities, seral stages, hardwoods, riparian areas, etc., would be required in each alternative and provide for that component. In terms of evenness, all alternatives would emphasize later seral stage vegetation, but they would provide in excess of 5 percent for each seral stage. The greatest change in pattern of vegetative seral stages would occur in alternatives that emphasize vegetative manipulation. Alternatives RPA and CUR would have the largest relative effect on pattern, but all alternatives would have a much smaller effect on pattern when compared to recent historical levels.

Botany

All alternatives would provide for protection of plants listed as sensitive by the Regional Forester.

Facilities

Road Construction and Reconstruction. During the 1st decade, road construction and reconstruction would occur in varying amounts as shown in **Table II-13.**

Trail Construction/Reconstruction. Refer to **Table II-16.**

Table II-13
Road Construction/Reconstruction
by Alternative (1st Decade)
(Average Miles per Year)

Alternative	Construction	Reconstruction
PRF	22	22
RPA	23	22
CUR	23	22
CBF	15	16

Fire and Fuels

Fire and fuels management programs would include fuel treatment activities, such as utilization of material for alternate energy, personal use firewood, commercial firewood, prescribed burning and fuelbreak maintenance and construction, and wildfire activities, such as presuppression planning and direct suppression actions.

Presuppression would be planned to provide protection and an appropriate suppression response to meet burned acre predictions in the most efficient manner. Suppression strategy on all lands would be to control fires at the least size/cost unless, in future Wilderness Management Plans, a strategy of confinement or containment is developed and authorized.

Future Wilderness Management Plans may authorize suppression strategies of containment or confinement where site specific criteria so indicates.

All alternatives would have a suppression organization in line with the most efficient level as determined by the National Fire Management Analysis system. Acres burned annually would be higher than in recent history due to the large number of acres in all alternatives that

Table II-14
Acreage Allocations by Management
Prescriptions and Alternatives
(Acres)

	Management Prescription	PRF	RPA	CUR	CBF
I	Unroaded Non-Motorized Recreation	65,048	22,092	5,027	120,630
II	Limited Roaded Motorized Recreation	62,926	11,388	15,593	6,589
III	Roaded Recreation	313,878	292,556	360,487	245,486
IV	Roaded, High Density Recreation	6,247	6,290	6,678	6,290
V	Wilderness Management*	498,776	498,776	498,776	506,496
VI	Wildlife Habitat Management	214,962	182,612	114,509	207,116
VII	T and E and Selected Sensitive Species	536,069	530,358	528,129	625,896
VIII	Timber Management **	366,572	537,354	544,220	341,703
IX	Riparian Management***	27,775	27,775	27,775	27,775
X	Special Area Management	25,724	8,776	16,783	29,996
XI	Cultural Resource Management	3,570	3,570	3,570	3,570
Total Acres		2,121,547	2,121,547	2,121,547	2,121,547

* Acreage shown includes Wild and Scenic Rivers, Research Natural Areas, and cultural resource areas within wilderness.

** Acreage includes both suitable and unsuitable timber lands.

*** All riparian areas would be managed according to this prescription. Acreages are estimates and would be approximately the same in all alternatives. Acres do not include riparian area acreage in Prescriptions V and VII.

are not available for fuels management, primarily with natural fuel accumulations.

Fisheries

The theme and resource objectives prescribe the actions which would occur in a given alternative. **Table II-15** presents a visual comparison by alternative of the elements that are important to the Forest fisheries program.

Forest Pests

Integrated Pest Management (IPM) would be moderately to intensively practiced on lands where vegetation is actively managed. Therefore, Alternatives RPA and CUR, with relatively large amounts of land to be actively managed, would have larger IPM programs. Smaller IPM programs would be expected in Alternative CBF, where more land would be subject to minimal pest management activities.

The degree of Forest pest activity and resulting resource damage in an alternative would be directly affected by the degree or intensity of the IPM program.

Lands

Lands activities would be the same under all alternatives. Land line location would continue at a rate of about 150 miles per year. Land purchase financing would be limited to lands considered valuable for outdoor recreation purposes or those needed to conserve threatened, endangered, or sensitive species of fish, wildlife or plants. This limitation is legislatively imposed on the purchase funds available (Land and Water Conservation Funds). The purchase of desirable properties would be handled on a willing seller-willing buyer basis. This frequently results in opportunity purchases as desirable lands become available.

Under all alternatives desired, available private inholdings would be acquired within existing Wildernesses and the Shasta and Trinity Units of the Whiskeytown Shasta-Trinity National Recreation Area (NRA). Most cases would involve small, individually owned parcels.

Minerals

Mineral resource development opportunities are related to the number of acres available for mineral exploration and development. Lands withdrawn from mineral entry affect mineral activity potential. Withdrawals from mineral entry would be tied directly to RNA establishment, creation of new wildernesses and designation of wild portions of Wild and Scenic Rivers. The largest acreage to be withdrawn occurs under Alternative CBF. The least acreage withdrawn is under Alternative RPA.

There are three mineral categories: mineral materials, leasables, and locatables. These would occur under any alternative. The Forest Service issues permits for the mineral materials (common varieties such as sand, gravel, cinders, etc.). The Bureau of Land Management issues leases for Federally-owned deposits of oil, gas, geothermal, coal, phosphate, sodium, potassium, and sulphur on the National Forest lands when recommended by the Forest Service. Locatable minerals (gold, silver, etc.) are acquired by filing a mining claim under the General Mining Law of 1872, as amended. These types of minerals become subject to regulations governing leaseable minerals in established National Recreation Areas. Oil, gas, and geothermal resource leases are appropriate for all alternatives. The only current interest in geothermal is in the northeast portion of the Shasta Forest.

Range

In comparison to the current level (8,300 animal month [AMs]), livestock grazing would remain about the same in Alternative PRF and would increase by about 18 percent (10,000 AMs) in Alternative RPA. Grazing would decrease to about 8,300 AMs for Alternative CBF.

Recreation

Developed Recreation. All alternatives would meet projected demand for developed recreation through the first two decades. Water-oriented recreation would be emphasized. Alternatives PRF, RPA, and CBF would meet demand over the entire planning period through expansion of existing sites and construction of new ones. Program emphasis in Alternative CUR would cause the most significant differences in the 3rd, 4th and 5th decades between developed recreation opportunities offered and demand. No new sites would be constructed; no existing substandard sites would be rehabilitated; and some existing sites would be closed, if necessary.

Dispersed Recreation. Alternatives PRF and RPA would meet projected demand through the planning period. Alternatives CUR and CBF would not.

Off-highway vehicle (OHV) use opportunities for open, usable areas would be similar for all alternatives. Use would occasionally be restricted in some areas to avoid conflict with non-motorized activities. Expansion of cross-country skiing opportunities would be encouraged in all alternatives.

Table II-15
A Comparison of Alternatives by Fisheries Evaluation Elements

Evaluation Elements	PRF	RPA	CUR	CBF
Surveys and Inventories				
Habitat Typing				
Anadromous Fish Streams	Complete On All Selected.	Complete On All Selected	Complete On All Selected	Complete On All Selected
Trout Streams	Complete On All selected.	Complete On All Selected	Complete On Most selected	Complete On Most Selected
Major Perennial Streams	Complete On Most Class 1/2	Complete On All Class 1/2	Complete On A Few Class 1	Complete On A Few Class 1
Minor Perennial Streams	Complete On A Few Class 3	Complete On Most Class 3	None	None
Streamside Riparian Inventories	Complete On Most Class 1	Complete On Most Class 1/2	Complete On A Few Class 1	Complete On A Few Class 1
Coordinated Resource Inventories (CRI)	Limited	Increase	Very Limited	Limited
Natural Habitat Recovery				
Non-Sensitive Anadromous Fish	Increase	Decrease	Limited	Significant Increase
Sensitive Anadromous fish				
Spring-Run Chinook Salmon	Increase	Decrease	Limited	Increase
Summer Steelhead Trout	Increase	Decrease	Limited	Increase
Habitat Improvement				
Non-Sensitive Anadromous Fish	Increase	Increase	Low-Moderate	Decrease
Sensitive Anadromous Fish				
Spring-Run Chinook Salmon	Limited	Limited	Limited	Limited
Summer Steelhead Trout	Limited	Limited	Limited	Limited
Inland Warmwater Fish	Increase	Significant Increase	Low-moderate	Significant Increase
Bull Trout	No Action	No Action	No Action	No Action
Redband Trout	Trout Creek + 2 Others	Significant Increase	Trout Creek Only	Trout Creek Only
Rough Sculpin	No Action	No Action	No Action	No Action
Inland Coldwater Fish				
Major Perennials	Increase	Significant Increase	Very Limited	Very Limited
Minor Perennials	Analyze Need/ Opportunities	Increase	None	None

Table II-15
Continued

Evaluation Elements	PRF	RPA	CUR	CBF
Monitoring and Evaluation				
Non-Sensitive Anadromous	Increase	Increase	Limited	Increase
Sensitive Anadromous	Increase	Increase	Limited	Increase
Inland Warmwater Fish	Increase	Increase	None	Increase
Bull Trout	No Action	No Action	No Action	No Action
Redband Trout	Trout Creek Only	Trout Creek + 1 other	Trout Creek [Very Limited]	Trout Creek [Very Limited]
Rough Sculpin	None	None	None	None
Inland Coldwater Fish				
Major Perennials	Limited	Increase	Very Limited	None
Minor Perennials	None	Limited	None	None

Table II-16
Comparison of Annual Outputs by Alternative for Decades 1 and 5*

Resource Element	Base Year 1989	'90 RPA Goals	Decade	ALTERNATIVE PRF	RPA	CUR	CBF	1990 CUR
Economics								
Total Budget (Million Dollars [MM$])	40	-	1	43.2	43.1	39.8	38.1	28
			5	49.7	47.3	43.0	44.1	26
Total Cost (MM$)	44	-	1	56.8	56.8	53.4	51.7	31
			5	63.3	60.9	61.6	57.8	29
Facilities								
Transportation								
Trail Construction/Reconstruction (miles)	0/1	-	1	5/5	10/10	2/2	5/5	6
			5	5/5	10/10	2/2	5/5	2
Road Construction (miles)	63	-	1	22	23	23	15	79
			5	5	5	5	5	44
Road Reconstruction (miles)	73	-	1	22	22	22	16	71
			5	21	22	23	17	69
Road Maintenance (miles)	6,500	-	1	6,570	6,580	6,580	6,500	6,828
			5	6,880	6,900	6,900	6,740	9,173
Dams and Reservoirs (number)								
Forest Service	2	-	1	2	2	2	2	2
			5	2	2	2	2	2
Other Federal	3	-	1	3	3	3	3	3
			5	3	3	3	3	3
Other State/Local	1	-	1	1	1	1	1	1
			5	1	1	1	1	1
Private	10	-	1	10	10	10	10	10
			5	10	10	10	10	10
Administrative Sites (number)								
Forest Service Owned	24	-	1	26	26	26	26	26
			5	26	26	26	26	26
Leased	2	-	1	0	0	0	0	0
			5	0	0	0	0	0

* See the last page of this table for abbreviated terms and meanings.

Table II-16
Comparison of Annual Outputs by Alternative for Decades 1 and 5*

Resource Element	Base Year 1989	'90 RPA Goals	Decade	ALTERNATIVE PRF	RPA	CUR	CBF	1990 CUR
Fire and Fuels								
Total Fuel Treatment (acres)	6,300	-	1	6,480	6,580	7,080	5,880	11,622
			5	6,580	6,680	7,180	5,980	10,086
Fire-Related Treatment	1,500	-	1	1,500	1,500	1,500	1,500	2,500
			5	1,500	1,500	1,500	1,500	2,500
Timber-Related Fuel Treatment	4,500	-	1	4,400	4,700	5,200	4,000	8,022
			5	4,400	4,700	5,200	4,000	5,386
Other Fuel Treatment (for wildlife)	300	-	1	380	380	380	380	1,100
			5	480	480	480	480	2,000
Expected Acres Burned by Wildfire			1	11,000	11,000	15,000	11,000	7,136
			5	11,000	11,000	15,000	11,000	8,064
Intensity Class 1	32	-	1	55	55	75	55	29
			5	55	55	75	55	33
Intensity Class 2	48	-	1	154	154	210	154	167
			5	154	154	210	154	188
Intensity Class 3	774	-	1	330	330	450	330	231
			5	330	330	450	330	261
Intensity Class 4	850	-	1	451	451	615	451	583
			5	451	451	615	451	658
Intensity Class 5	3,345	-	1	4,686	4,686	6,390	4,686	3,298
			5	4,686	4,686	6,390	4,686	3,722
Intensity Class 6	1,350	-	1	5,324	5,324	7,260	5,324	2,828
			5	5,324	5,324	7,260	5,324	3,202
Fish								
Inland Fish (Other than T&E)			1	1,817	1,947	1,557	1,713	1,424
(M Pounds)	1,424	1,794	5	1,817	1,947	1,734	1,837	1,424
Anadromous Fish			1	691	691	691	691	691
Commercial (M Pounds)	363	457	5	691	691	691	691	691
Sport (M Pounds)	113	142	1	353	563	293	353	163
			5	353	563	413	353	163

Table II-16
Comparison of Annual Outputs by Alternative for Decades 1 and 5*

Resource Element	Base Year 1989	'90 RPA Goals	Decade	ALTERNATIVE PRF	RPA	CUR	CBF	1990 CUR
Fish (continued)								
Direct Habitat Improvement (acres/structures)			1	30/90	80/125	17/35	39/82	1/10
Inland Fish	15/25	-	5	30/90	80/125	17/70	39/82	3/30
Anadromous Fish (Commercial)	0/0	-	1	0/0	0/0	0/0	0/0	0/0
			5	0/0	0/0	0/0	0/0	0/0
Anadromous Fish (Sport)	5/50	-	1	30/64	30/120	20/48	30/64	1/8
			5	30/64	30/120	20/80	30/64	3/24
Direct Habitat Improvement (Thousand Fish User Days [MFUDs])	396	-	1	410	415	374	388	356
Inland Fish			5	410	415	406	412	751
Anadromous Fish (Sport)	40	-	1	160	265	130	85	40
			5	160	265	190	115	83
Human Resources								
Programs (Enrollees)	50	-	1	50	50	50	50	50
			5	50	50	50	50	50
Lands and Minerals								
Minerals (Operating Plans)	122	146	1	125	131	125	85	119
			5	183	192	183	85	119
Land Acquisition (Acres)	6,996	-	1	1,500	1,500	1,500	1,500	6,820
			5	1,500	1,500	1,500	1,500	6,820
Range								
Grazing (Thousand Animal Months[M AMs])	12	-	1	11.9	14.2	12	8.3	12
			5	11.9	14.2	12	8.3	12
Recreation								
Developed Public (MM RVDs)	.71	-	1	.75	.75	.75	.75	.75
			5	1.2	1.11	.69	1.2	.69
Developed Private (MM RVDs)	.49	-	1	.51	.51	.51	.51	.51
			5	.83	.92	.83	.83	.83

Table II-16
Comparison of Annual Outputs by Alternative for Decades 1 and 5*

Resource Element	Base Year 1989	'90 RPA Goals	Decade	ALTERNATIVE PRF	RPA	CUR	CBF	1990 CUR
Recreation (continued)								
Dispersed (MM RVDs)	2.56	-	1	2.9	2.9	2.8	2.8	2.8
			5	5.3	5.3	5.0	5.0	5.0
Wilderness (MM RVDs)	.13	-	1	.14	.14	.14	.14	.14
			5	.25	.25	.25	.25	.19
Open, Usable OHV Areas - Summer (M Acres)	239.2	-	1	239.2	256.1	243.0	220.2	243.0
			5	239.2	256.1	243.0	220.2	243.0
Open, Usable OHV Areas - Winter (M Acres)	176.2	-	1	176.2	198.7	187.7	98.8	187.7
			5	176.2	198.7	187.7	98.8	187.7
Roads & Trails Open Only to OHV Use - Summer (Miles)	0	-	1	0	0	0	0	52
			5	0	0	0	0	185
Roads & Trails Open Only to OHV Use - Winter (Miles)	0	-	1	0	0	0	0	36
			5	0	0	0	0	138
Roads & Trails Closed to OHV Use - Summer (Miles)	810	-	1	810	810	810	810	0
			5	810	810	810	810	0
Roads & Trails Closed to OHV Use - Winter (Miles)	815	-	1	815	815	815	815	175
			5	815	815	815	815	320
Timber								
Allowable Sale Quantity (MMCF)	28	-	1	13	16.9	15.9	9.8	34.6
			5	14.4	18.6	17.5	10.2	34.6
Allowable Sale Quantity (MMBF)	184	-	1	87	112.4	105.8	65.3	236.5
			5	95.9	123.9	116.6	68.1	236.5
Long Term Sustained Yield (MMCF)	-	-	1	16.4	20.5	19.1	11.3	39.7
			5	16.4	20.5	19.1	11.3	39.7
Long Term Sustained Yield (MMBF)	-	-	1	109.6	136.7	127.4	75.3	266.0
			5	109.6	136.7	127.4	75.3	266.0
Reforestation (Acres)	9,400	8,084	1	4,600	4,700	5,200	3,000	8,020
			5	4,600	4,700	5,200	3,000	5,390
Timber Stand Improvement (Acres)	7,800	-	1	6,600	7,100	7,800	6,200	11,260
			5	6,600	7,100	7,800	6,200	8,300

Table II-16
Comparison of Annual Outputs by Alternative for Decades 1 and 5*

Resource Element	Base Year 1989	'90 RPA Goals	Decade	ALTERNATIVE PRF	RPA	CUR	CBF	1990 CUR
Wood Products Other Than Sawtimber								
Firewood (M Cords)	21	-	1	25	25	25	25	31
			5	30	30	30	30	36
Visual Quality								
Visual Quality Index	127.3	-	1	127.3	127.4	127.2	127.4	122.0
			5	131.5	128.1	129.8	128.1	111.3
Water								
Quality (M Acre feet at standard)	5,448	-	1	5,438	5,462	5,458	5,437	5,448
			5	5,437	5,458	5,453	5,435	5,450
Increased Quantity (M Acre feet)	5,450	-	1	-12	+12	+8	-13	0
			5	-13	+8	+3	-15	0
Watershed Improvement (Acres)	399	706	1	300	700	300	300	53
			5	300	300	300	300	53
Wildlife								
Threatened, Endangered and Sensitive Species (TE&S)								
Bald Eagle (# managed pairs)	25	-	1	32	32	32	32	20
			5	35	35	35	35	20
Goshawk (# pairs)	150	-	1	150	150	150	150	190
			5	150	150	150	150	190
Peregrine Falcon (# managed pairs)	6	-	1	9	9	9	9	6
			5	14	14	14	14	6
Spotted Owl (# pairs)	97	-	1	170	170	72	185	72
			5	210	210	72	210	72
Wildlife - Other than T&E								
Deer (M Animals)	62	-	1	62	62	62	62	66
			5	62	74	62	62	71
Direct Habitat Improvement (M WUDs)								
All Species	2	-	1	44	65	20	35	1
			5	61	393	51	61	7

Table II-16
Comparison of Annual Outputs by Alternative for Decades 1 and 5*

Resource Element	Base Year 1989	'90 RPA Goals	Decade	ALTERNATIVE PRF	RPA	CUR	CBF	1990 CUR
Wildlife (continued)								
Acres/Structures of Direct Habitat Improvement								
All Species	1360/35	-	1	5050/150	8224/126	2081/79	4962/143	1100/9
			5	8760/310	7670/260	2192/164	5163/296	1200/16
Wildlife User Days (M WUDs)								
Consumptive Species	282	338	1	282	282	282	282	285
			5	282	282	282	282	291
Non-Consumptive Species	282	347	1	282	282	282	282	304
			5	504	504	504	504	551
Total WUDs	564	-	1	608	629	584	599	589
			5	847	1,179	837	847	842

* Abbreviated Terms and Meanings for this Table

M = Thousand
MMBF = Million Board Feet
MMCF = Million Cubic Feet
OHV = Off-Highway Vehicle
RVDs = Recreation Visitor Days

Table II-17
Additional Key Comparisons by Alternatives (1st Decade)

	ALTERNATIVE			
	PRF	RPA	CUR	CBF
Recreation Opportunities				
RVDs*				
Primitive (P)	143,600	143,650	143,600	144,975
Semi-Primitive Non-Motorized (SPNM)	170,500	103,340	98,642	419,630
Semi-Primitive Motorized (SPM)	299,987	172,507	175,376	193,878
Roaded Natural (RN)	2,721,163	1,325,640	2,873,541	2,891,647
Rural (R)	554,300	2,144,463	598,391	239,470
PAOT**				
Primitive	997	997	997	1,013
Semi-Primitive Non-Motorized	1,123	748	620	2,195
Semi-Primitive Motorized	12,247	7,696	7,683	8,886
Roaded Natural	116,265	63,118	127,228	119,469
Rural	103,053	645,720	125,043	3,136
Visual Quality Objectives				
M Acres***				
Preservation (P)	498.7	498.7	498.7	498.7
Retention (R)	467.1	467.1	467.1	467.1
Partial Retention (PR)	589.0	589.0	589.0	589.0
Modification (M)	466.1	466.1	466.1	466.1
Maximum Modification (MM)	100.6	100.6	100.6	100.6
Wilderness				
Acres	498,776	498,776	498,776	506,496
Research Natural Areas				
Number	9	5	8	13
Acres	24,760	13,400	21,470	26,970
Wild and Scenic Rivers				
Miles				
Existing Wild	39.3	39.3	39.3	39.3
Recommended Wild	42.0	0.0	0.0	56.8
Subtotal Wild	**81.3**	**39.3**	**39.3**	**96.1**
Existing Scenic	22.1	22.1	22.1	22.1
Recommended Scenic	17.3	0.0	0.0	25.1
Subtotal Scenic	**39.4**	**22.1**	**22.1**	**47.2**
Existing Recreation	45.0	45.0	45.0	45.0
Recommended Recreation	2.9	0.0	0.0	34.7
Subtotal Recreation	**47.9**	**45.0**	**45.0**	**79.7**
Total	**168.6**	**106.4**	**106.4**	**223.0**

* RVDs = Recreation Visitor Days
** PAOT = People-At-One-Time
*** M Acres = Thousand Acres

Riparian Areas

Practices to protect stream courses and riparian resources would be included in the riparian management standards and guidelines for all alternatives. Riparian Management Zones (RMZs) vary in width. They average 350 feet on both sides of perennial (Class 1 and 2) streams and 150 feet on both sides of intermittent and ephemeral (Class 3 and 4) streams. No timber management activities would be scheduled adjacent to perennial streams; they would be modified along intermittent streams. Average RMZ widths would be applied according to the riparian standards described under Management Prescription IX in Chapter 4 of the proposed Forest Plan.

Soils

Land management practices such as timber harvesting, reforestation site preparation, and vegetation type conversion can affect soil productivity. Soil quality standards and Best Management Practices (BMPs) that mitigate soil erosion, compaction, nutrient loss, and organic matter loss would protect soil productivity. BMPs would be employed for each alternative.

Harvest levels and acres impacted would be much less than historical levels; however, soil productivity could still be effected.

Alternative CBF would potentially affect the fewest acres anually at 5,880; Alternative PRF would affect 5,900 acres. Alternatives RPA and CUR could affect soil productivity the most by permitting harvesting on 8,890 and 9,660 acres, respectively.

Special Areas

Research Natural Areas (RNA). Proposed allocations for RNA establishment range from a low of 13,400 acres (5 areas) in Alternative RPA to a high of 26,970 acres (13 areas) in Alternative CBF. The designation under Alternative PRF is 24,760 acres (9 areas), and Alternative CUR, 21,470 acres (8 areas). These figures do not include the existing Shasta Mud Flow RNA (3,115 acres) which would be retained in all alternatives.

Special Interest Areas (SIA). Proposed allocations for SIA establishment range from a low of 9 areas in Alternative CUR, to 13 areas in Alternative RPA, to 15 areas in Alternative CBF, to a high of 19 areas in Alternative PRF.

Timber

Table II-18 displays important timber related information about the alternatives and one of the benchmarks. This timber information shows how the alternatives differ from each other in response to each of their management objectives. Important differences between alternatives are explained below.

Suitable Acres - The amount of suitable timber acres reflects the differences in land allocations between alternatives. The total suitable acres are primarily a function of the following: (1) the amount of area allocated to wilderness and semi-primitive non-motorized (SPNM) recreation; and (2) the amount of area dedicated to threatened, endangered, and sensitive (TE&S) wildlife, and retention of older over-mature habitat.

Alternatives RPA and CUR have the most suitable acres. Alternative PRF has fewer suitable acres due primarily to additional allocations for T&E species and limited roaded motorized recreation. Alternative CBF has the least amount of suitable acres due to additional wilderness, unroaded non-motorized and additional T&E species habitat.

Inventory - This is the total inventory on the suitable lands. Inventory values are generally proportionate to the suitable acres. Those alternatives with more suitable lands generally display a higher beginning inventory than alternatives with less suitable land.

The ending inventory volumes are a reflection of the suitable acres, the ending age class distribution, and the management intensity of the timber prescriptions applied. The ending inventories vary as a result of the differing harvest levels and the subsequent growth rates on the different land bases in the alternatives. Alternative CBF carries the smallest inventory of all the alternatives due to a relatively small land base.

Allowable Sale Quantity (ASQ) - The ASQ for an alternative is reflective of the amount of suitable timber land and the intensity of management on those lands. Alternatives with a large amount of suitable land that would be managed intensively, such as in Alternative RPA, would have a higher ASQ. Alternatives with a small amount of suitable land and/or land that would not be intensively managed, such as in Alternative CBF, would have a lower ASQ.

Long-Term Sustained Yield Capacity (LTSY) - The LTSY is also a reflection of suitable acres and management intensity. It is, theoretically, the highest uniform yield that could be obtained over time from the regulated (suitable) land base in an alternative, under a specified management intensity. In most cases, the differences in LTSY vary directly with the amount of suitable land.

Growth - Net growth is largely a function of the amount of acres regenerated in the early decades in an alternative. It is also affected by the intensity of management and by differences in the amount of suitable land in each alternative. Most of the net growth increase is due to the rate at which understocked and slow-growing stands are regenerated and replaced with new, faster growing, younger stands. Net growth is highest in those alternatives where a relatively large amount of regeneration cutting is done on a large suitable land base.

Intensity Level - The 70-100 percent yield category represents those prescriptions which reflect relatively minor reductions in projected timber growth and yield because of other resource constraints. The 20 percent yield category represents those prescriptions which reflect major reductions in growth and yield due to other resource constraints or considerations such as extended rotations or special cutting practices.

Alternatives with a higher proportion of suitable land in the higher yield category, such as Alternative RPA, would generate more yields than an alternative with a greater amount of suitable land in the reduced yield categories, such as in Alternative CBF.

Regeneration Harvest Acres - The regeneration harvest acres generally vary directly with the ASQ. The number of regeneration harvest acres is highest in those alternatives with a high ASQ, such as Alternatives RPA and CUR.

Those alternatives that have more flexibility in selecting the regeneration harvest methods have the greatest proportion of clearcutting, such as Alternative RPA. This is because clearcutting is normally the selected method when maximizing either present net value (PNV) or timber volumes (ASQ). In alternatives where the primary objective is to emphasize resources other than timber, such as Alternatives PRF and CBF, the amount of clearcutting was restricted and, therefore, more green tree retention and/or selection cutting was selected.

The amount of land to be reforested varies directly with the regeneration harvest acres.

Comparison with Existing Timber Management Plan (TMP) - The total suitable land base in Alternative PRF is significantly less than the commercial forest land base in the existing TMP (about 575,300 acres versus 1,074,400 acres). This decrease is due primarily to past land adjustments (exchanges) and the allocation of tentatively suitable timber land to non-timber prescriptions. This includes semi-primitive non-motorized recreation areas, the Shasta Unit of the NRA, major wildlife areas, such as spotted owl habitat conservation areas, riparian management zones along perennial streams, and research natural areas. In addition, suitable lands which are non-stocked (hardwoods, brushfields, etc.) are not included in the suitable timber land base in Alternative PRF due to high costs.

The ASQ in Alternative PRF is significantly less than the potential yield in the existing TMP (87 million board feet [MMBF] versus 312.6 MMBF). The actual sold volume under the existing TMP (1975-1992) has averaged about 200 MMBF per year. The primary difference between the ASQ and the potential yield is due to a reduction in the suitable timber land base. Also, the potential yield includes 96.8 MMBF from the marginal component. The marginal component includes yields from hardwoods, unstable lands, and non-regenerable lands. These lands are classified as unsuitable in Alternative PRF and, therefore, are not included in the ASQ determination.

Land Classification for Timber - The tentatively suitable timber land base would not vary by alternative. However, a wide variation would exist among the alternatives in their use of tentatively suitable lands for timber production. The amount of tentatively suitable timber land which is available for timber management under an alternative is dependent upon the management objectives reflecting the theme of each alternative, economic efficiency, and resource allocations which preclude timber production. A summary of timber land suitability classifications for each alternative is presented in **Table II-19**.

Visual Quality

All alternatives provide the same basic visual protection for Wildernesses, the NRA, candidate state scenic highways, and developed recreation sites. Most recreationists and travelers would continue to view a landscape that is not dominated by management activities.

Alternatives RPA and CBF do not provide as much visual protection along the main travel routes as Alternatives PRF and CUR. Away from the main travel routes, management practices and the resulting visual quality varies widely among alternatives. Alternatives RPA and CUR allow slightly more dominant alterations than the other alternatives. Semi-primitive areas, wild and scenic rivers, and uneven-aged management are emphasized more in Alternative CBF. The visual effect of the differences in emphasis is shown by the difference in visual quality objectives (VQOs). **Figure II-2** displays the percent of National Forest lands for each alternative which would be managed for particular VQOs.

The visual quality index (VQI) rates the amount and degree of alteration to the landscape, which occurs in different variety classes, for each alternative. The VQI provides another method of comparing visual resource outputs. The ratings are based on research assumptions of public preferences for certain categories of landscapes. A higher VQI represents a higher visual

Table II-18
Timber Resource Management Information

	ALTERNATIVE*				
	Benchmark MMR**	PRF	RPA	CUR	CBF
Suitable Lands (M acres)	679.1	575.3	638.1	635.8	495.4
Inventory					
Current (Million Cubic Feet [MMCF])	1,532	1,474	1,526	1,586	1,140
Current per Acre (Cubic Feet [CF])	2,256	2,562	2,391	2,494	2,301
End of the 16th Decade - 160 years from current (MMCF)	1,639	2,260	2,066	2,074	1,343
1st Decade Average Annual Allowable Sale Quantity (ASQ)					
ASQ (MMCF)	20.0	13.0	16.9	15.9	9.8
Percent of Current Inventory	1.4	1.0	1.2	1.1	1.0
ASQ (Million Board Feet [MMBF])	133.5	87.0	112.4	105.9	65.3
Long Term Sustained Yield Capacity (LTSY)					
MMCF	23.6	16.6	21.7	20.3	11.9
Percent of End Inventory (16th Decade)	1.4	0.8	1.3	1.0	1.0
Maximum ASQ/Percent of LTSY***	95	91	95	95	95
Average Annual Net Growth					
CF per Acre/Present	32.8	38.8	34.5	39.2	22.5
CF per Acre/Year 2030	41.3	42.8	40.6	44.9	30.7
Total MMCF/Year 2030	28.1	24.6	25.9	28.6	15.2
Area & Percent of Suitable Land by Intensity Level					
70 - 100% Yield (Intensive + Modified Management)					
M Acres	553.9	473.0	537.7	502.8	372.7
Percent of Total	82	82	84	79	75
20 Percent Yield (Minimal Management)					
M Acres	125.2	102.3	100.4	133.0	122.7
Percent of Total	18	18	16	21	25
Regeneration Harvests - 1st Decade					
Clearcut (M Acres)	58.7	3.0	38.1	31.6	0.0
Green Tree Retention ****	0.0	23.6	9.3	17.8	26.9
Selection (M Acres)	0.0	17.6	0.0	3.0	14.0
Harvest Total/Percent of Suitable Lands	8.6	7.7	7.4	8.2	8.3

* Tentatively suitable timber lands for all alternatives = 1,077.8 M Acres, and present inventory = 2,847 MMCF.

**MMR = Management Requirements.

***Long Term Sustained Yield not met during the planning horizon (16 decades or 160 years). The maximum ASQ reached during the planning horizon is shown as percent of LTSY.

****Includes Shelterwood cuts.

Table II-18
(Continued)

DATA FROM EXISTING SHASTA-TRINITY TIMBER MANAGEMENT PLAN - 1975 (Amended):

Potential Yield:	Shasta Working Circle =	142.7	MMBF/year,
	Trinity Working Circle =	169.9	MMBF/year,
	Total Shasta-Trinity =	**312.6**	**MMBF/year.**
Average Annual Volume Sold (1975-1992):	Shasta Working Circle =	95	MMBF/year,
	Trinity Working Circle =	105	MMBF/year,
	Total Shasta-Trinity =	**200**	**MMBF/year.**
Acres:	Standard Component =	548,227	acres,
	Special Component =	112,288	acres,
	Marginal Component =	413,866	acres,
	Total =	**1,074,381**	**acres.**

rating. VQIs range from 131.5 in Alternative PRF to 128.1 in Alternatives RPA and CBF in the 5th decade. This represents an increase in VQI ranging from one percent to three percent. See **Table II-16** for a display of the VQI for each alternative.

Water

Water quantity would not be measurably different between alternatives due to reduced timber harvest levels. This is based on a comparison of the past 15 year average.

Water quality is potentially affected by vegetation disturbance caused by wildfire, timber harvest, or type conversion. The only potential differences between alternatives is in the number of acres of timber being harvested.

Standards and guidelines (see Chapter 4 of the proposed Forest Plan) would assure that water quality would not be adversely effected. They include Best Management Practices (BMPs) and the Riparian Management standards and guidelines (S&Gs). Although the S&Gs would help protect water quality, there is the potental for degradation to occur. The amount of degradation would be in proportion to the number of acres harvested by alternative.

Alternatives RPA and CUR could potentially have the largest affect on water quality. Alternatives PRF and CBF would have a lesser affect.

Wild and Scenic Rivers

Alternatives RPA and CUR would add no additional miles of Wild, Scenic, and Recreation Rivers to the existing 106.4 miles currently designated. Alternative PRF would recommend 62.2 (National Forest land only) additional miles of streams. Alternative CBF would add 116.6 miles.

Figure II-3 provides a comparative display of the number of miles recommended as Wild, Scenic, and Recreation Rivers for each alternative.

Wilderness and Roadless Areas

The four alternatives analyzed in detail show few differences in the number of acres designated for wilderness. This is because of the enactment of the 1984 California Wilderness Act which designated as Wilderness about 24 percent of the land base of the Shasta-Trinity National Forests. Under the Act, only areas designated as "further planning" could be considered for wilderness during this round of Forest planning. Thus, 498,776 (net) acres are designated under all alternatives except CBF. Under Alternative CBF the Mt. Eddy area, the only area identified under the California Wilderness Act for "further planning," would be proposed for wilderness designation. Therefore, an additional 7,720 acres in Prescription V (Wilderness Management) would be recommended under Alternative CBF or about 1.5 percent more than in the other alternatives.

All alternatives would maintain and manage most of the former roadless areas in a natural condition. Overall, Alternative CBF would retain the most roadless acres in a natural state (88 percent), while Alternative RPA would retain the least roadless areas in a natural state (71 percent). (Refer to Appendix C.)

Wildlife

Wildlife management objectives would maintain habitat to support all species on the Forests at or above viable population levels. The distribution and variety of wildlife habitat would vary by alternative but would be maintained in all alternatives.

Accountability for management indicators would be Forest-wide, but objectives would be measured at the management area level.

Forest standards and guidelines pertaining to special habitat components would set the minimum level of management throughout the Forests in all alternatives.

An average of at least 1.5 snags and 5 tons of dead/down material per acre would be maintained in all alternatives. These levels would generally be exceeded throughout most of the Forests. This varies from a low of 70 percent in Alternatives RPA and CUR to a high of 82 percent in Alternative CBF.

Hardwood forest types would be managed primarily for the benefit of wildlife species in all alternatives.

In the 1st decade, direct habitat improvement acres for all wildlife species would vary from a high of 8,224 acres per year in Alternative RPA to a low of 2,081 acres per year in Alternative CUR.

The acreage allocated to Prescription VI (Wildlife Management) ranges from a high of about 214,962 acres in Alternative PRF to a low of about 114,509 acres in Alternative CUR.

Alternatives RPA and CUR retain the largest amount of acres in the early to mid-seral stages, while Alternatives

Table II-19
Land Classification for Timber
(M Acres in Decade 1)

	ALTERNATIVE			
	PRF	**RPA**	**CUR**	**CBF**
Non-Forested Land (includes water)	119	119	119	119
Forested Land	2,002	2,002	2,002	2,002
Forested Land Currently Withdrawn from Timber Production*	452	452	452	452
Forested Land not Capable of Producing Industrial Wood	331	331	331	331
Forested Land Physically Unsuited				
• Irreversible Damage to Soils, Watersheds or Productivity Likely to Occur	91	91	91	91
• Unregenerable within 5 Years of Final Harvest	53	53	53	53
Inadequate Information to Project Responses	0	0	0	0
Tentatively Suitable Timber Base	1,074	1,074	1,074	1,074
Not Suitable for Timber under the Alternative**	501	438	440	580
Total Unsuitable Acres	**1,429**	1,366	1,369	1,509
Total Suitable Acres	**573**	636	633	494
Total National Forest Acres	**2,121**	**2,121**	**2,121**	**2,121**

* Areas withdrawn by an Act of Congress, the Secretary of Agriculture, or the Chief of the Forest Service.

** Lands identified as not appropriate for timber production due to (1) assignment to other resource uses to meet alternative objectives; (2) management requirements; or (3) not being cost efficient in meeting alternative objectives over the planning horizon.

PRF and CBF retain the largest amount of acres in the mid to late seral stages. (See **Table IV-3** in the Biological Diversity Section of Chapter IV for seral stage acres by alternative).

Wildlife - Threatened, Endangered (T&E), and Sensitive Species

Threatened

Spotted Owl. All alternatives provide for spotted owl habitat by the allocation of HCAs and DCAs from the Interagency Scientific Committee (ISC) Report and the draft recovery plan, respectively, to Prescription VII (Threatened, Endangered, and Selected Sensitive Species). In addition, all remaining lands are subject to the 50-11-40 rule.

Marbled Murrelet. There are no known occurrences and/or nesting sites on the Forests.

Endangered

Bald Eagle. All alternatives would meet the Forests' portion of the recovery goal of 20 nesting pairs. Habitat to achieve this goal would be provided in all alternatives.

Peregrine Falcon. All alternatives would meet the Forests' portion of the recovery goal of 6 nesting pairs. Habitat to achieve this goal would be provided in all alternatives.

Sensitive

Goshawk. All alternatives would provide for management of 150 territories. Alternatives RPA and CUR would manage a minimum of 100 acres for each territory, and Alternatives PRF and CBF would manage 150 acres.

Figure II-2
Visual Quality Objectives (VQOs)
By Alternative

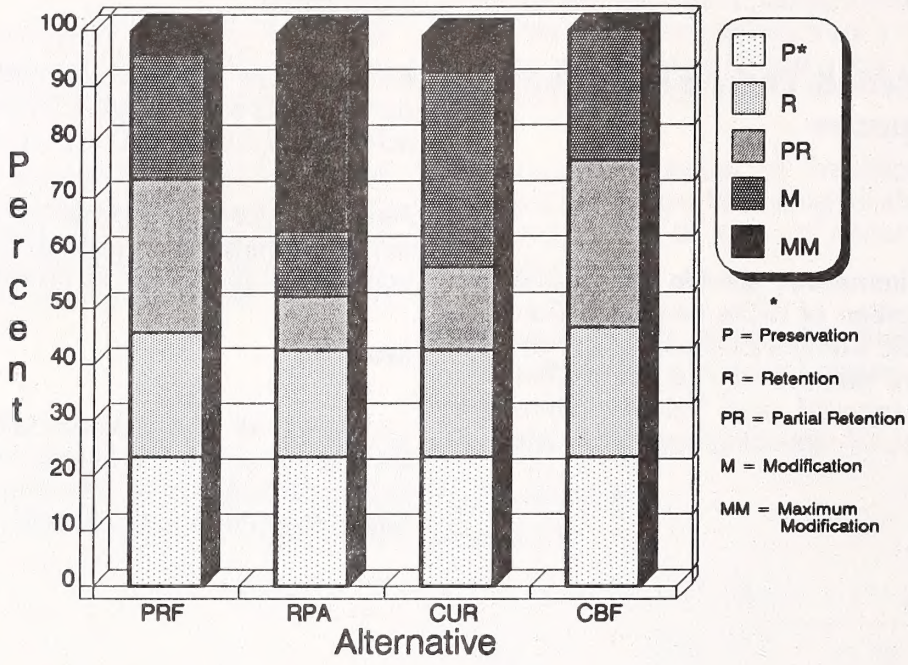
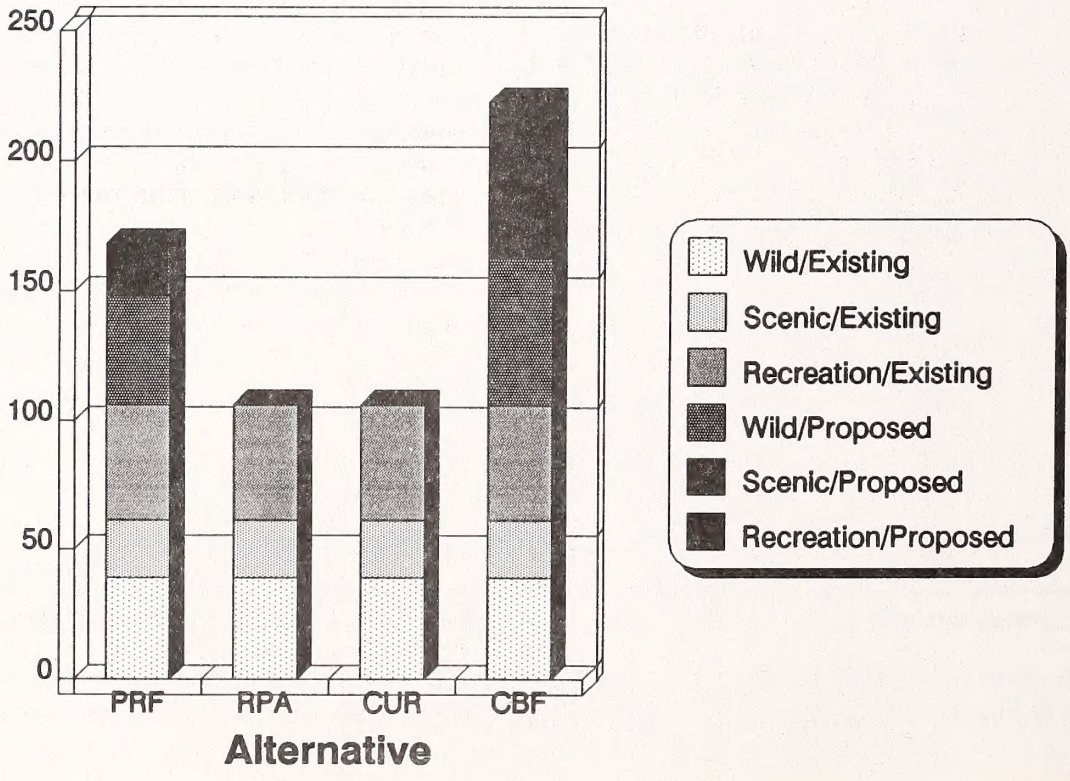


Figure II-3
Wild and Scenic Rivers by Alternative



Economic Comparisons

The purpose of this section is to compare economic values and significant trade-offs as they relate to the four alternatives. Refer to Appendix B for a detailed and technical discussion of the models and assumptions used in these comparisons.

Several economic terms used here require a brief explanation. Present net value (PNV) is mentioned frequently in this section. PNV is an estimate of the market value of forest resources after all costs have been subtracted. See Appendix D for a discussion of PNV and its relationship to costs, values, and net public benefit (NPB).

Net cash flow, as shown in **Tables II-23, II-25,** and **II-26,** is the difference between cash receipts and timber sales, campground use, other chargeable items, and Federal costs. **Table II-24** defines net cash flow for the timber program only. In other words, cash receipts from timber sales are subtracted from timber costs (i.e., sale preparation, reforestation, timber stand improvement, and roads).

The cost and benefit categories, as used here, also warrant a brief explanation. Direct comparisons of cost and benefit for a given output can be misleading. The roads cost category, for example, contributes to the value of timber and recreation. Similarly, the costs of timber production contribute to the value of wildlife outputs. Thus, the costs and benefits of production cannot be reliably separated and attributed to any individual resource.

Table II-20 - Summary Comparison of Economic Effects. Table II-20 is a comprehensive summary of costs, benefits, county revenues, and social effects. Benefits are categorized as cash and non-cash. Cash benefits are actual collections for sales of timber, fees for recreation use, firewood and Christmas tree cutting permits, and special use permit fees from operators of commercial businesses on National Forest lands.

Cash benefits (labeled as **returns to the U.S. Treasury** in **Table II-20**) vary primarily as a result of the timber harvest level and timber value over time. The timber harvest level varies little from one decade to the next for all the alternatives, and the real value of timber is assumed to increase at one percent annually. This results in an increase in cash benefits over time. By the 5th decade cash benefits range from a 47 percent increase (over 1989 levels) for Alternative CBF to a 137 percent increase for Alternative RPA.

Non-cash benefits are assigned to resources which have a monetary value but for which no collection is made. These resources include water, wildlife, fish, wilderness recreation, dispersed recreation and free-use developed recreation sites. Overall, non-cash benefits far exceed cash benefits. In most alternatives, non-cash benefits exceed 90 percent of total benefits. This is caused primarily by recreation use and water production and the dollar values assumed for each.

Water production varies little and all alternatives, except CUR, meet the demand for developed, dispersed and wilderness recreation. By the 5th decade non-cash benefits average a 63 percent increase when compared to 1989 levels.

Cost figures are detailed in **Table II-20**. All costs reflect 1989 dollars. **Total cost** is presented and then adjusted for cooperative funds from non-Federal agencies (private and public) to obtain **Federal costs**. Total cost is adjusted once again by deducting emergency fire fighting funds. The **total budget**, composed of Congressionally appropriated funds, is equal to Federal costs less the cost of fighting forest fires. Costs are separated into two major components: **operations and maintenance**, and **capital investment**.

County revenue figures include 25 percent receipt shares and county yield tax revenues. These revenues, plus estimates of area income and employment generated by Forest expenditures and outputs, form a picture of the local area of impact of the various alternatives. The level of timber harvest is instrumental in determining county revenues. Revenues in the 1st decade range from a decrease of $3.1 million for Alternative CBF to an increase of $1.25 million for Alternative RPA, when compared to the 1989 level.

Income and employment estimates are based on the number of recreation visitor days, timber volume, range allotments, and Forest Service purchases by alternative. These output levels are multiplied by income and employment multipliers developed in an Input/Output model (see Appendix B). Timber volume and recreation use account for most of the total jobs and income. Forest Service purchases account for about 15 percent of the total jobs and income, with range allotments accounting for less than 1 percent for all alternatives. Total income and employment varies according to the timber harvest level. Alternative RPA is the highest and Alternative CBF the lowest.

Social impact indicators are displayed in the form of discounted benefits, discounted costs, PNV, and benefit/cost ratios. Discounted benefits are composed of market (i.e., timber) and non-market valued outputs (i.e., water, recreation, and wildlife). Discounted benefits vary by alternative. Alternative RPA has the most discounted benefits, since it has a high recreation program and a high timber output. Alternative CUR has a low recreation program but is second only to Alternative RPA

Table II-20
Summary Comparison of Economic Effects
(Millions of 1989 Dollars)

	ALTERNATIVE			
	PRF	RPA	CUR	CBF
1. Total Benefits Base Year 292				
Decade 1	307	316	315	301
Decade 2	370	381	378	364
Decade 3	401	411	409	394
Decade 4	438	447	445	430
Decade 5	483	498	495	473
2. Returns to the U.S. Treasury Base Year 30				
Decade 1	22	30	29	17
Decade 2	32	42	40	27
Decade 3	37	47	45	32
Decade 4	44	55	53	37
Decade 5	55	71	69	44
3. Non-Cash Benefits Base Year 262				
Decade 1	285	286	286	284
Decade 2	338	339	338	337
Decade 3	364	364	364	362
Decade 4	394	392	392	393
Decade 5	428	427	426	429
4. Total Costs Base Year 44				
Decade 1	57	57	58	52
Decade 2	58	56	56	53
Decade 3	60	58	58	54
Decade 4	61	58	59	55
Decade 5	63	61	62	58

1. Total benefits include both cash returns to the U.S. Treasury and non-cash benefits. Total benefits are the estimated total amount that consumers would be willing to pay for Forest outputs, whether or not this amount is actually collected by the U.S. Government.
2. Returns to the U.S. Treasury are estimated payments by consumers of Forest outputs collected by the Federal Government.
3. Non cash benefits are the difference between total estimated amount that consumers would be willing to pay for Forest outputs and the actual collections by the Federal Government. At present it is National policy to provide most Forest outputs at either no charge to consumers or at a charge less than total willingness to pay value.
4. Total costs include the Federal and non-Federal costs needed to produce Forest outputs.

Table II-20
Summary Comparison of Economic Effects
(Millions of 1989 Dollars)

	ALTERNATIVE			
	PRF	RPA	CUR	CBF
5. Non-Federal Costs Base year 1.5				
Decade 1	2	2	2	2
Decade 2	2	2	2	2
Decade 3	2	2	2	2
Decade 4	2	2	2	2
Decade 5	2	2	2	2
6. Federal Costs Base year 43				
Decade 1	55	55	56	50
Decade 2	56	54	54	51
Decade 3	58	56	56	52
Decade 4	59	56	57	53
Decade 5	61	59	60	56
7. Total Budget Base Year 40				
Decade 1	43	43	40	38
Decade 2	44	42	38	39
Decade 3	46	44	39	40
Decade 4	47	44	40	42
Decade 5	50	47	43	44
8. 25 Percent Receipt Shares Base Year 7				
Decade 1	5	8	7	4
Decade 2	8	10	10	7
Decade 3	9	12	11	8
Decade 4	11	14	13	9
Decade 5	14	18	17	11

5. Non-Federal costs include all costs paid by non-Federal cooperators (examples include State Fish and Game habitat improvement expenditures, range capital investmemts made by the permittee, etc).

6. Federal costs are all borne by the Federal Government. Includes costs paid from general tax receipts, costs paid from funds set aside from receipts (such as KV) and costs paid by accepting in-kind payments in lieu of cash (such as purchaser road credits). Federal costs also equal total costs less non-Federal cooperator costs.

7. Total budget is equal to Federal costs less the cost of fighting fires (FFF).

8. Twenty-five percent of returns to the U.S. Treasury is distributed back to the counties in proportion to the Shasta-Trinity National Forests' acreage in the counties.

Table III-21
Released Roadless Areas

	Name	Total Acres	Acres Tentatively Suitable for Timber Management
	Backbone	9,976	3,960
	Bell-Quinby B	11,707	6,455
	Bonanza King	16,386	6,219
*	Castle Crags B	1,732	851
*	Chanchelulla	3,865	2,160
	China Springs B	707	413
*	Chinquapin	21,520	13,290
	Cow Creek	23,152	5,557
*	Devils Rock	13,896	9,250
	Dog Creek	5,543	4,919
	Eagle	6,798	3,396
*	East Beegum	7,963	1,274
*	East Fork	5,195	3,041
	East Girard (total acres)	27,914	22,513
*	(Nature Conservancy Portion only)	(226)	(140)
*	Fisher Gulch	4,472	1,437
	Kettle Mountain	4,865	2,590
*	Little French Creek	11,227	2,301
*	Mt. Shasta B	2,958	1,734
	Murphy Glade	1,018	980
	Panther	11,727	2,683
*	Pattison	28,326	13,823
*	Penney Ridge	4,844	724
	Salt Gulch	6,657	4,178
	Slate Creek	6,616	6,064
*	South Fork	17,261	5,372
*	Underwood	3,219	2,035
	Wells Mountain	6,144	4,921
*	West Beegum	5,480	1,124
*	West Girard	34,892	15,813
	TOTAL	**306,060**	**149,077**

* Sixteen areas of concern to the public

in timber harvested. This results in Alternative CUR ranking second to RPA in discounted benefits.

Discounted costs are closely related to the timber harvest level. Generally the higher the timber output the higher the discounted costs.

PNV is equal to discounted costs subtracted from discounted benefits. PNV is a measure of investment efficiency over time, including the costs and values of market-priced and non-market-priced outputs. The ranking of PNV by alternative is identical to the ranking by discounted benefits.

There is also a measure of efficiency imbedded in the benefit/cost ratios. Alternative CUR, while having the second highest PNV, has the lowest benefit/cost ratio. This means that while additional dollars invested in this alternative have a positive PNV, the marginal value of those additional investments is less than the other alternatives.

Conversely, Alternative CBF has a high benefit/cost ratio. This is related to the high value of non-market outputs in relation to the cost of producing these outputs.

Table II-21 - Present Net Value (PNV) Comparison - Marginal Cost of Constraints. Table II-21 displays the economic effect of each major group of minimum management requirements (MMRs) on the total unbounded economic solution represented by the Maximum PNV (FLW) benchmark. (Refer to the MMR and benchmark discussions in the beginning of this Chapter.) The PNV, cost, and benefit entries in the table are the marginal or incremental values from the corresponding figure for the Minimum Level of Management (MLV) benchmark. As the MLV benchmark represents the background benefits and costs associated with simple maintenance of the Forests, then marginal values are net changes from a minimum level of management. Virtually all of the reductions in PNV are generated by corresponding reductions in timber harvest.

In total the MMRs cost $1,748 million in terms of reduced PNV, a drop of 17 percent. The viable population-diversity threatened and endangered (T&E) (spotted owl) constraint has the greatest effect, followed by the riparian constraints.

The viable population-diversity-T&E constraint maintains sufficient suitable spotted owl habitat, so that the continued existence of an adequate number and distribution of reproductive pairs is ensured throughout the existing range. The allocation of over 500,000 acres to HCAs and the application of the 50-11-40 rule, are required to meet this MMR (see Appendix B). The cost of this constraint, in terms of reduced PNV, is $1,601 million or 92 percent of the drop in PNV between the FLW and MMR benchmarks. This reduction in PNV is caused primarily by reduced timber revenues. This MMR masks the effects that other MMRs would have if it were not so restrictive. Because of the acres restricted to no timber harvest or reduced timber harvest, the effect of the dispersion/soil and water and non-declining yield constraints are not measurable; therefore, they are not shown on **Table II-21.**

The next most significant management limitation in the MMRs is the allowance for perennial riparian lands. On the Shasta and Trinity National Forests, outside of unsuitable lands and other more restrictive MMR constraints, over 25,000 acres are designated as riparian management zones. These lands have a MMR which limits harvesting to sanitation/salvage cuts which yield only about 5 percent of the standing inventory in these areas. In this manner, the riparian MMR accounts for 5 percent of the total drop in PNV between the FLW and MMR benchmarks. This constraint would have a greater affect but most riparian acres are already protected by the viable population-diversity-T&E MMR.

The above constraints account for approximately 97 percent of the reduction in PNV between the two benchmarks (FLW and MLV); the remaining $69 million reduction is due to minor effects by the dispersion constraint, the non-declining yield constraint and overlap.

Alternative CEE is the same as MMR due to the non-effect of minimum implementation requirements. Any effect they might have had was made unmeasurable by the effect of the MMRs.

Finally, PNV drops an additional $17 million when the Forest constraints common to each alternative (Alternative CEF) are used.

The loss in discounted benefits due to constraints is $2,558 million, a 20 percent drop. Timber benefit losses account for most of this drop. Discounted costs drop $793 million, or 33 percent. Timber and road costs account for most of the total drop in costs.

Table II-22 - Present Net Value Comparison of Alternatives. Table II-22 displays the alternatives in order of decreasing PNV. The associated PNV, benefits, and costs are itemized for comparison. Alternative CEF and the MLV benchmark are used to provide a frame of reference against which all the other alternatives are compared.

As in the benchmark analysis, the MLV benchmark describes the background outputs and fixed costs associated with maintaining the Forests. All cost and benefit figures shown in **Table II-22** are the difference between each alternative cost or benefit figure and the corresponding cost or benefit figure for the MLV benchmark. Alternative CEF incorporates all MMRs and those Forest constraints common to all alternatives.

Table II-21
Present Net Value Comparison - Marginal Cost of Constraints
(Millions of 1989 Dollars)

I.D. Code	Name	PNV	PNV Change*	Discount Costs	Discount Costs Change*	Discount Benefits	Discount Benefits Change*
FLW	**PNV without MMRs**	3,867		1,589		5,456	
Viable Population, Diversity, T&E, constraints*****			-1,601		-699		-2,270
Riparian Constraint			-78		-49		-127
Other constraints and overlap			-69		-60		-129
MMR	**PNV with MMRs**	2,119	-1,748	811	-778	2,930	-2,526
Visual Corridor constraint							
CEE		2,119	-1,748	811	-778	2,930	-2,526
Common Forest Constraints			-17		-15		-32
CEF	=CEE with Common Forest Constraints	2,102	-1,765	796	-793	2,898	-2558
MLV	Minimum Level ****	6,589		802		7,391	

		Discount Benefits by Resource				Discount Costs by Category			
I.D. code	Name	Timber	All Rec.	Wildlife	Other **	Timber	Roads	All Rec.	Other ***
FLW	**PNV without MMRs**	2,942	1,496	198	819	1,160	138	176	114
Viable Population, Diversity, T&E Riparian Constraints Balance Due to Overlap		**See Text for Discussion**							
MMR	**PNV with MMRs**	970	1,496	183	282	439	51	176	76
Visual Corridor Constraint									
CEE	Common Forest Constraints	945	1,496	183	274	425	49	176	76
CEF	=CEE with Common Forest Constraints	945	1,496	183	274	425	49	176	76
MLV	Minimum Level	0	1,409	1,199	4,782	0	0	70	732

* All changes are measured incrementally from the PNV without the MMR benchmark. All costs, benefits, and PNV are net of the minimum level values. Constraints causing the greatest change in the PNV are listed first.

** Other discounted benefits include Range and Water.

*** Other discounted costs include Range, Wildlife, Fish, General Administration, and Fire costs.

**** The minimum level benchmark shows naturally occuring background benefits and fixed costs associated with maintaining the National Forest in Federal ownership. All other values are expressed as differences from the minimum level in order to display incremental tradeoffs. Other benefits are high due to constant water benefit in all alternatives exceeding 4.5 million dollars.

***** The acres allocated to T&E habitat for MMR mask all other constraints except the riparian constraints; therefore, no other MMRs are shown on this table.

Abbreviated terms and meanings for this table:

CEE	Constrained Economically Efficient Alternative
CEF	Constrained Economically Efficient Alternative with Forest Constraints
FLW	Flow and Long Term Sustained Yield
MLV	Minimum Level of Management
MMR	Minimum Management Requirements
PNV	Present Net Values

Table II-22
Present Net Value - Comparison of Alternatives
(Millions of 1989 Dollars)

I.D. Code	PNV	Change*	Discount Costs	Change*	Discount Benefits	Change*
CEF	2,103		796		2,899	
RPA	1,880	-223	718	-78	2,598	-301
CUR	1,650	-453	736	-60	2,386	-513
PRF	1,645	-458	694	-102	2,339	-560
CBF	1,539	-564	627	-169	2,166	-733
MLV****	6,589		802		7,391	

	Discount Benefits by Resource				Discount Costs by Category			
I.D. Code	Timber	All Rec.	Wildlife	Other**	Timber	Roads	All Rec	Other***
CEF	944	1,496	183	274	425	49	176	76
RPA	786	1,473	187	151	352	49	173	75
CUR	736	1,317	187	145	336	49	168	114
PRF	524	1,496	186	133	324	49	176	145
CBF	358	1,496	186	125	267	38	176	76
MLV****	0	1,409	1,199	4,783	0	0	70	732

* All changes are measured incrementally from the PNV without the MMR benchmark. All costs, benefits, and PNV are net of the minimum level values.

** Other discounted benefits include Range and Water.

*** Other discounted costs include Range, Wildlife, Fish, General Administration, and Fire costs.

**** The minimum level benchmark shows naturally occurring background benefits and fixed costs associated with maintaining the National Forest in Federal ownership. All other values are expressed as differences from the minimum level in order to display incremental tradeoffs. Other benefits are high due to constant water benefit in all alternatives exceeding 4.5 million dollars.

Table II-23
Average Annual Cash Flows and Non-Cash Benefits
(Millions of Undiscounted Dollars per Year)

	Decade 1				Decade 5			
Alternative	Net Cash Flow	Total Federal Cost	Returns to Treasury	Non-Cash Benefits	Net Cash Flow	Total Federal Cost	Returns to Treasury	Non-Cash Benefits
RPA	-25	55	30	286	12	59	71	427
CUR	-27	56	29	286	9	60	69	426
PRF	-33	55	22	285	-6	61	55	428
CBF	-33	50	17	284	-12	56	44	429

Discounted benefits range from $2,899 million in Alternative CEF to $2,166 million in Alternative CBF. Resources contributing most to these changes are by order of importance: timber and recreation. Timber benefits range from $944 million in Alternative CEF to $358 million in Alternative CBF. Recreation benefits range from $1,496 million in Alternatives CEF, PRF, and CBF to $1,317 million in Alternative CUR. Water has a large, consistent effect on discounted benefits in all alternatives. It makes up over 90 percent of the "other benefits" category.

Discounted costs vary from $796 million in Alternative CEF to $627 million in Alternative CBF. These changes are attributed primarily to timber, roads, and recreation. Timber costs range from $425 million in Alternative CEF to $267 million in Alternative CBF. Road costs range from $49 million in Alternative RPA to $38 million in Alternative CBF. Road costs do not vary by alternative except for Alternative CBF. Most of the road system needed is already in place. Recreation costs range from $176 million in Alternatives RPA and PRF to $168 million in Alternative CUR.

PNV varies from $2,103 million in Alternative CEF to $1,539 million in Alternative CBF. The largest changes in PNV are caused by timber and recreation.

Table II-23 - Average Annual Cash Flows and Non-Cash Flow Benefits. This table deducts total Federal costs from returns to the U.S. Treasury to obtain net cash flow. Net cash flow is a net cash position after Federal outlays are deducted from cash receipts from sales of timber, recreation use, and various permits. Net cash flow is a measure of economic efficiency in the shorter term where PNV is a measure of efficiency in the long term.

Expenditures are greater than returns to the U.S. Treasury in all alternatives in the 1st decade. However, by the 5th decade all alternatives have significantly improved their cash flows with Alternatives PRF and CBF still being negative.

The primary reason for negative cash flows in the 1st decade is that most road building and recreation investments occur during this time. By the 5th decade cash flows improve because returns to the Federal treasury increase while total Federal costs remain practically constant. Primary reasons for this trend are reduced road-building costs, greatly reduced recreation investment costs, no real cost increase, and a real price increase of one percent for timber.

The ranking of the alternatives by net cash flow generally follows the timber harvest level. Alternative RPA has the highest decade 1 and 5 cash flows and Alternative CBF the lowest.

Table II-24 - Average Annual Timber Cash Flows - Decade 1. This table deducts costs associated with timber harvest from returns to the U.S. Treasury due to the sale and cutting of timber. Timber receipts account for a high percentage of the returns to U.S. Treasury for all alternatives while timber costs comprise only 20 to 30 percent of all Federal costs. It is not surprising, therefore,

Table II-24
Average Annual Timber Cash Flows - Decade 1
(Millions of Undiscounted Dollars per Year)

Alternative	Timber Net Cash Flow
RPA	8.1
CUR	6.6
PRF	2.3
CBF	-0.8

to expect timber net cash flows to be higher than the overall net cash flows shown in **Table II-23**. Thus, from a forest-wide perspective, below cost sales are not anticipated to be a problem in any alternative except CBF in the 1st decade.

Table II-25 - Summary Listing of Reasons for Changes in Present Net Value. This table compares the alternatives in order of highest to lowest PNV. Alternative CEF is used as the basis of comparison.

Table II-25
Summary Listing of Reasons for Changes in Present Net Value

Compared to the Constrained Economically Efficient Alternative with Forest Constraints (CEF)

Alternative CEF (Constrained Economically Efficient Alternative With Forest Constraints)

PNV = $8,692 million; Used as the Basis for Comparison

Net Cash Flow (Decade 5) = $22 million

This alternative is the most economically efficient, as it has the highest PNV. In addition to the MMRs and MIRs, this alternative has Forest constraints common to all alternatives. Forest constraints include: (1) managing the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) and developed recreation sites as unsuitable; (2) managing the foreground of the Trinity Unit of the NRA as minimal timber; and (3) managing the middleground of the Trinity Unit, 100 foot intermittent riparian zones, and parts of Interstate 5 and Highway 299 as modified timber harvest. The PNV results from a combination of the following: Cash benefits include timber sales receipts, developed recreation receipts including special uses, and other receipts from grazing etc. The greatest percentage of the PNV is from non-cash benefits such as the estimated value of wildlife user days, dispersed recreation user days, and non-charge developed recreation user days.

Resource Utilization Emphasis Category residents, primarily those viewing the Forest as a source of jobs and income, would find increased opportunites through recreational development and expansion. However, they would find decreased timber production over average levels of the past 15 years. Resource Amenity Emphasis Category residents, who are less commodity oriented, would view the decrease in timber harvest and the improvement in visual quality as beneficial.

Recreationists, who are primarily attracted to large reservoirs, wildernesses, and ski areas, would see little change in their recreational experience. They would benefit by new developments that keep pace with recreational demand.

Alternative RPA (1990 RPA Program Emphasis)

PNV = 8,469 million; Change in PNV = -$223 million

Net Cash Flow (Decade 5) = $12 million

PNV is reduced from Alternative CEF because of a reduced timber base. Additional constraints include: more restrictive riparian standards and guidelines, allocation of certain areas to Research Natural Areas, reduced harvest levels around some dispersed recreation sites, reduced harvest in bitterbrush areas, and additional visual constraints.

Timber yields would benefit long-time residents by providing employment opportunities and county receipts. Employment opportunities and county receipts would be greater than the other alternatives considered in detail but would be less than CEF. Levels of employment and county receipts would be less than average levels of the past 15 years. Recreationists and Resource Amenity Emphasis Category residents may find the environmental impacts, particularly improved visual quality and more older over-mature habitat on suitable land, consistent with their values and beliefs.

Alternative CUR (No Action/No Change)

PNV = $8,239 million; Change in PNV = -$453 million

Net Cash Flow (Decade 5) = $9 million

Alternative CUR approximates the 1989 timber harvest situation but legal requirements for compliance with the T&E species law would result in County income and employment significantly lower than 1989 levels. This alternative has the second highest PNV of all alternatives. When compared to Alternative RPA, the primary negative effect on PNV is the recreation program (lowest of all alternatives). Timber harvest levels are 7.4 MMBF less than Alternative RPA due primarily to reduced harvest levels relating to additional allocations for bitterbrush (deer habitat) and visual resource protection.

Timber yields would benefit long-time residents by providing employment opportunities and county receipts. Employment opportunities and county receipts would be greater than Alternatives PRF and CBF but would be less than Alternatives CEF and RPA. Levels of employment and county receipts would be less than average levels of the past 15 years. Recreationists and Resource Amenity Emphasis Category residents may find the environmental impacts, particularly improved visual quality and more older over-mature habitat on suitable land, consistent with their values and beliefs.

Alternative PRF (Preferred Alternative)

PNV = $8,234 million; Change in PNV = -$458 million

Net Cash Flow (Decade 5) = $-6 million

When compared to Alternative CUR, additional constaints were added to this alternative that had negative effects on PNV:

The number of acres available for timber harvest activities did not decrease significantly but the intensity of treatments allowed did. This reduction in intensity occurred due to the use of green tree retention (GTR) as the primary form of regeneration treatment as compared with more traditional clearcut treatments. GTR emphasizes leaving 6-12 large trees per acre and all utilizable advanced regeneration. This results in a landscape that reflects a continuous forest cover. The recreation program is at the most cost effective level which is the same as Alternative CBF, slightly higher than RPA and higher that CUR.

Timber yields would benefit long-time residents by providing employment opportunities and county receipts. Employment opportunities and county receipts would be greater than Alternative CBF but less than Alternatives CEF, RPA and CUR. Levels of employment and county receipts would be less than average levels of the past 15 years. Recreationists and Resource Amenity Emphasis Category residents may find the environmental impacts, particularly improved visual quality and more older over-mature habitat on suitable land, consistent with their values and beliefs.

Alternative CBF (Citizens for Better Forestry)

PNV = $8,128 million; Change in PNV = -$564 million

Net Cash Flow (Decade 5) = $-12 million

When compared to Alternative PRF, several changes were added to this alternative that effect PNV negatively. The major reduction occurred due to the allocation of roadless areas not in Management Prescriptions I (Unroaded Non-Motorized Recreation) and VII (Threatened, Endangered, and Selected Sensitive Species). In addition, there were additional allocations for visuals that precluded or reduced timber harvest. The intensity of harvest prescriptions allowed was reduced over Alternative PRF primarily by not allowing any clearcutting, retaining 12 trees per acre on most acres where GTR would be applied, and limiting practices on slopes over 40 percent.

This alternative has the same recreation program as Alternative PRF.

Emphasis on older over-mature dependent species, protecting riparian zones, and allocating many of the roadless areas to semi-primitive non-motorized recreation would be beneficial to the lifestyles of Recreationists and Resource Amenity Emphasis Category residents. Lower market outputs would cause county receipts, local income, and jobs to be less than all other alternatives, and, therefore, not beneficial to the lifestyle of long-term residents who are economically dependent on the forest commodity outputs.

Table II-26 - Indicators of Responsiveness to Selected Issues and National Concerns.

PNV and net cash flow are indicators of concern to taxpayers. They measure responsiveness to national issues of economy in governments and deficit reduction. The alternative ranking by PNV and the alignment with net cash flow shows certain differences in priority. Alternative CBF ranks last in net cash flow and has the lowest PNV. Alternative RPA has the highest net cash flow and PNV of the alternatives considered in detail. Net cash flow is a measure of net dollar returns to the U.S. Treasury. As such it is determined primarily by timber receipts. PNV includes dollar benefits other than timber (i.e. recreation, wildlife, and water). This explains why all alternatives have positive PNVs, but the net cash flows are only positive in the 5th decade in Alternatives CEF, RPA and CUR. These alternatives have the highest allowable sale quantity (ASQ).

Available jobs and local income are indicators of local economic concerns. There is a high degree of correlation within these two categories. The alternative with the highest number of jobs produces the most local income, while the alternative with the lowest number of jobs produces the least income.

ASQ and acres of intensive timber management deal with a major issue on the Forests. Generally, the more acres in intensive timber management the higher the timber output.

The amount of older over-mature habitat on the Forests is an issue at the National, Regional, and Forest level. Generally, the lower the ASQ, the greater the amount of older over-mature forest remaining at the end of the 5th decade.

Summary Comparison of Environmental Consequences by Alternative

Table II-27 presents an overview of the impacts which would occur as a result of implementing any of the alternatives described in this Draft EIS. Refer to Chapter IV for a detailed discussion of the consequences specific to each resource.

Alternative Comparisons Using Responses to Public Issues

A fifth and final means of comparing alternatives is through evaluation of the degree to which each alternative responds to the various public issues. These are illustrated in **Table II-28**. Refer to Chapter I and Appendix A for a detailed description of the major public issues and the scoping process used to develop them.

Table II-26
Indicators of Responsiveness to Selected Issues and National Concerns

Alternative	PNV - MM$	MM$/Year Decades 1/5	Total Personal Income (MM$/Year)	Direct and Indirect Employment (M Persons/Year)
		Community Effects (Public Issue #7)		
CEF	8,760	-24/22	160	4,213
RPA	8,469	-25/12	148	3,888
CUR	8,239	-27/9	140	3,682
PRF	8,234	-33/-6	138	3,633
CBF	8,128	-33/-12	122	3,208

	PNV - MM$	1st Decade ASQ(MMBF/Year)	Old Growth After 5th Decade (M Acres*)	Timber-Management (M Acres**)
		Timber Effects (Public Issue #16)		
CEF	8,760	128.7	340	554
RPA	8,469	112.4	358	538
CUR	8,239	105.9	363	503
PRF	8,234	87	368	473
CBF	8,128	65.3	370	372

* On suitable and unsuitable timber lands.

** On capable, available, and tentatively suitable timber lands.

Abbreviated Terms and Meanings:

ASQ = Allowable Sale Quantity
CBF = Citizens for Better Forestry
CEF = Constrained Economically Efficient Alternative with Forest Constraints
CUR = No Action/No Change
M Acres = Thousand Acres
M Persons = Thousand Persons
MM$ = Million Dollars
MMBF = Million Board Feet
PNV = Present Net Value
PRF = Preferred Alternative
RPA = 1990 RPA Program Emphasis

Table II-27
Summary Comparison of Environmental Consequences by Alternative

		ALTERNATIVE			
Resource	**Subject(s)**	**PRF**	**RPA**	**CUR**	**CBF**
Biological Diversity	Seral Stage Acres at end of Decade 5				
	Early (seral stages 1&2)	177,000	185,000	181,000	173,000
	Middle (seral stages 3a,3b,& 3c)	740,000	724,000	711,000	725,000
	Late (seral stages 4a,4b,&4c)	355,000	353,000	361,000	356,000
	Older over-mature (Seral stage 4c-older)	368,000	358,000	364,000	370,000
Cultural Resources	Degree of Risk of adverse effects on sites compared with current conditions	Moderate potential risk of site disturbance based on acres of timber management.	High potential risk of site disturbance based on acres of timber management.	High potential risk of site disturbance based on acres of timber management	Lowest potential risk of site disturbance based on acres of timber management.
Economics	Predicted % change in PNV as compared to Current Alternative	-3%	1%	0%	-3%
	Predicted % change in receipts to county as compared to Current Alternative - Decade 1	-29%	14%	0%	-43%
	Predicted change in employment as compared to Current Alternative - Decade 1	-1%	6%	0%	-13%
Fire & Fuels	Acres planned for fuel treatment - Decade 1	6,480	6,580	7,080	5,880
Fisheries	Projected number of pounds for MIS fish species - Decade 1				
	Anadromous	353,000	563,000	293,000	353,000
	Inland	1,817,000	1,917,000	1,557,000	1,713,000
Human and Community Development	Impact on social groups	Major impact on social groups such as long-time residents whose jobs, either directly or indirectly, are dependent on the timber/ wood fiber industry.	Major impact on social groups such as long-time residents whose jobs, either directly or indirectly, are dependent on the timber/ wood fiber industry.	Major impact on social groups such as long-time residents whose jobs, either directly or indirectly, are dependent on the timber/ wood fiber industry.	Major impact on social groups such as long-time residents whose jobs, either directly or indirectly, are dependent on the timber/ wood fiber industry.

Table II-27 (Continued)

Resource	Subject(s)	ALTERNATIVE PRF	RPA	CUR	CBF
Minerals	Acres withdrawn above the 927,000 acres common to all alternatives				
	RNA	15,055	4,275	12,345	23,765
	Wilderness	0	0	0	7,720
	Wild Rivers	6,432	0	0	7,808
	Total	21,487	4,275	12,345	39,293
Range	Changes in AM output from current	-1,700	-1,700	0	-1,700
Recreation	Developed and dispersed recreation effects				
	Developed public (MM RVDs)				
	Decade 1	.75	.75	.75	.75
	Decade 5	1.2	1.1	.7	1.2
	Dispersed (MM RVDs)				
	Decade 1	2.9	2.8	2.8	2.8
	Decade 5	5.3	5.3	5	5
Timber	Long-Term Sustained Yield (MMBF/year)	110.6	144.4	135.5	75.3
	Growth in Decade 5 (MMBF/year)	164.1	172.8	190.5	101.4
	Appearance of Forest Lands	About 22% of the total forest acres would have fairly intensive timber management activity of some kind at some point in time. This would include openings in the forest canopy for the purpose of regenerating new stands.	About 25% of the total forest acres would have fairly intensive timber management activity of some kind at some point in time. This would include openings in the forest canopy for the purpose of regenerating new stands.	About 24% of the total forest acres would have fairly intensive timber management activity of some kind at some point in time. This would include openings in the forest canopy for the purpose of regenerating tot- new stands.	About 17% of the total forest acres would have fairly intensive timber management activity of some kind at some point in time. This would include openings in the forest canopy for the purpose of regenerating new stands.
		Some large trees would be left in most of the openings. A minor amount of clearcutting would be evident, especially on steeper slopes. These openings would average about 10-12 acres in size, with the largest openings being about 20 acres.	Most of the openings would be clearcuts, on both steep slopes and flat ground. Large trees would not normally be left in the openings. These openings would average about 20 acres in size, and as large as 40 acres.	Most of the openings would be clearcuts, on both steep slopes and flat ground. Large trees would be left in some of the openings. These openings would average about 20 to 25 acres in size.	Some large trees would be left. Openings would normally not exceed 20 acres in size. On flatter slopes, openings would be smaller, but more frequent, where selection logging is practiced.

Table II-27 (Continued)

Resource	Subject(s)	ALTERNATIVE PRF	RPA	CUR	CBF
Timber (continued)		On flatter slopes, openings would normally be smaller, but much more frequent, where selection logging is practiced. These openings would normally be less than 2 acres in size.			These openings would normally be less than 2 acres in size.
		Another 5% of the total forest acres would have minor timber activities, mainly individual tree removal, which would not normally be evident to the casual forest visitor.	Another 5% of the total forest acres would have minor timber activities, mainly individual tree removal, which would not normally be evident to the casual forest visitor.	Another 6% of the total forest acres would have minor timber activities, mainly individual tree removal, which would not normally be evident to the casual forest visitor.	Another 6% of the total forest acres would have minor timber activities, mainly individual tree removal, which would not normally be evident to the casual forest visitor.
		The remaining 73% of the forest acres would have no planned timber activity and would remain virtually unchanged.	The remaining 70% of the forest acres would have no planned timber activity and would remain virtually unchanged	The remaining 70% of the forest acres would have no planned timber activity and would remain virtually unchanged	The remaining 77% of the forest acres would have no planned timber activity and would remain virtually unchanged
		Existing stands would be converted to young stands at an average rate of about 4400 acres per year. In 50 years about 10% of the forest would consist of stands which are less than 50 years of age.	Existing stands would be converted to young stands at an average rate of about 4700 acres per year. In 50 years about 11% of the forest would consist of stands which are less than 50 years of age.	Existing stands would be converted to young stands at an average rate of about 5200 acres per year. In 50 years about 12% of the forest would consist of stands which are less than 50 years of age.	Existing stands would be converted to young stands at an average rate of about 4100 acres per year. In 50 years about 10% of the forest would consist of stands which are less than 50 years of age.
Visual Quality	Visual Quality Index (VQIs)	Candidate state scenic highways, the NRAs, developed recreation areas and most high use recreation areas would be managed for scenic quality.	Candidate state scenic highways, the NRAs, developed recreation areas and most high use recreation areas would be managed for scenic quality.	Candidate state scenic highways, the NRAs, developed recreation areas and most high use recreation areas would be managed for scenic quality.	Candidate state scenic highways, the NRAs, developed recreation areas and most high use recreation areas would be managed for scenic quality.
		The landscape setting along wild and scenic rivers and semi-primitive areas would be more natural appearing than CUR or RPA.	The landscape setting along wild and scenic rivers and semi-primitive areas would receive the least protection of all alternatives.	The landscape setting along wild and scenic rivers and semi-primitive areas would be more natural appearing than PRF or CBF.	The landscape setting along wild and scenic rivers and semi-primitive areas would be more natural appearing than any other alternative.

Table II-27 (Continued)

Resource	Subject(s)	ALTERNATIVE PRF	RPA	CUR	CBF
Visual Quality (continued)		The future visual condition, as measured by the VQI, would increase by 18.9%.	The future visual condition, as measured by the VQI, would increase by 3.9%	The future visual condition, as measured by the VQI, would increase by 3.9%	The future visual condition, as measured by the VQI, would increase by 18.9%
Wild & Scenic Rivers	Miles of Rivers Designated				
	Existing	106.4	106.4	106.4	106.4
	New Wild	42	0	0	56.8
	New Scenic	17.3	0	0	25.1
	New Recreation	2.9	0	0	34.7
	Total New	62.2	0	0	116.6
	Total	**168.6**			**223**
Wilderness & Roadless Areas	Impacts on wilderness attributes.	Wilderness attributes would be maintained for existing areas. The wilderness attributes of the Mt. Eddy further planning area would be slightly diminished due to resource management activities on a small amount of the area.	Wilderness attributes would be maintained for existing areas. The wilderness attributes of the Mt. Eddy further planning area would be slightly diminished due to resource management activities on a small amount of the area	Wilderness attributes would be maintained for existing areas. The wilderness attributes of the Mt. Eddy further planning area would be slightly diminished due to resource management activities on a small amount of the area	Wilderness attributes would be maintained for existing areas. The wilderness attributes of the Mt. Eddy further planning area would also be maintained.
		About 81% of the 29 released roadless areas' acreage would remain undeveloped.	About 71% of the 29 released roadless areas' acreage would remain undeveloped.	About 72% of the 29 released roadless areas' acreage would remain undeveloped.	About 88% of the 29 released roadless areas' acreage would remain undeveloped.
Wildlife (end of 5th decade, 50 years)					
	Wildlife User Days (M WUDs)	61	393	51	61
	T&E and Sensitive Species				
	Spotted Owl (pairs)	210	210	72	210
	Bald Eagles (managed pairs)	35	35	35	35
	Peregrine Falcons (managed pairs)	14	14	14	14
	Goshawks (pairs)	150	150	150	150

Table II-28
Disposition of Public Issues

Public Issue	Output or Effect to be Measured (1st decade unless otherwise noted)	ALTERNATIVE PRF	RPA	CUR	CBF
Cultural Resources Issue #1					
How should the Forests effectively provide identification, protection and interpretation of archaeological, historical, and religious sites?	None	Significant cultural resources would be protected, enhanced, and interpreted. The monitoring plan would be the enforcement of S&G's. Inventory and evaluation of resources would vary among alternatives according to variations in resource outputs. Consultation with the State Historic Preservation Office would continue as required by 36 CFR 800.			
Biological Diversity Issue #2					
How should the Forests' vegetative resources be managed for ecosystem diversity?	None	Richness: None of the alternatives would reduce the total number of different plant or animal species. Evenness: All alternatives meet or exceed the 5% requirements for all seral stages of all major vegetation types on a Forest-wide basis. Pattern: Vegetative stands and their respective patterns would cycle naturally on about 73 percent of the Forests' land base. The greatest change in pattern on suitable lands would be the small reduction in early seral stages. There would be a corresponding increase in late seral stage vegetation types. RPA and CUR would have the least increase in late seral stage vegetation and the east decrease in early seral stage.			
Issue #3					
How much of the older vegetative seral stages existing on the Forests should be retained?		Standards and Guidelines relating to diversity and older over-mature dependent species would be implemented under all alternatives. Acres of older over-mature forests would increase in all alternatives.			
	Acres of older over-mature forest (5th decade)	351,000	358,000	364,000	370,000
Facilities Issue #4					
How many miles of additional roads are needed and to what standard should they be constructed and maintained in order to meet future needs?	Roads Maintained; Average/1st Decade (miles/year)	6,570	6,580	6,580	6,500
	Construction (miles/year)	22	23	23	15

* See last page of this table for "Abbreviated Terms and Meanings".

Table II-28
Disposition of Public Issues

Public Issue	Output or Effect to be Measured (1st decade unless otherwise noted)	ALTERNATIVE PRF	RPA	CUR	CBF
Facilities (Continued)	Reconstruction (miles/year)	22	22	22	16
Fire and Fuels Issue #5					
To what extent should prescribed burning be used as a way to reduce fuel hazards, prepare sites for reforestation, and improve wildlife habitat?		The use of prescribed fire for fire hazard reduction and other resource management (e.g., wildlife habitat management), as well as the means to mitigate its effects, is addressed in the standards and guidelines (Chapter 4, Plan). Utilization of woody debris would be emphasized over burning where possible.			
Fisheries / Water Issue #6					
How should watersheds be managed to maintain or enhance water quality and fisheries?	None	It is the intent under all alternatives to minimize impacts of program activities on fisheries and water and to ensure viable fish population levels. The riparian standards and guidelines and Best Management Practices would be adopted for all alternatives. See Chapter 4 of the Plan for a complete listing of the S&G's including requirements within riparian areas and widths of riparian management zones.			
Human and Community Development Issue #7					
What activities and outputs should be provided to maintain community stability?		The higher the County receipts and employment figures are, the better the alternative addresses this issue. Thus, Alternative RPA is the best and CBF is the worst at addressing this issue.			
	County Receipts (MM$)	6	5	6	4
	Employment (# of jobs)	6,311	6,456	6,800	5,900
Minerals Issue #8					
How can mineral development and exploration be encouraged while minimizing adverse impacts to non-mineral surface resources?	None	All alternatives recognize mineral development as a valid use of National Forest lands. All alternatives restrict mineral entry, to a degree, as a direct function of withdrawals.			

Table II-28
Disposition of Public Issues

Public Issue	Output or Effect to be Measured (1st decade unless otherwise noted)	ALTERNATIVE PRF	RPA	CUR	CBF
Mineral (continued)					
		In addition, Alternative CBF places management constraints on lands not withdrawn. Standards and Guidelines in the proposed Forest Plan recognize this use. The Riparian S&Gs encourage mineral development that is compatible with riparian values.			
		The goal stated in the Plan is to provide for and encourage the orderly development of mineral resources, applicable to both leasable and locatable minerals.			
Range					
Issue #9					
Is livestock grazing an appropriate use of wilderness? If so, how should conflicts be minimized between livestock use and recreationists?	None	As they become vacant or inactive, grazing allotments would be terminated in Alternatives PRF and CBF. The Riparian S&Gs would affect how grazing is managed in all riparian areas and wildernesses.			
Issue #10					
How should livestock grazing be managed to minimize degradation of riparian areas?	AMs	8,300	10,000	8,300	8,300
		Resolution of grazing conflicts within riparian areas would be emphasized by incorporating the Riparian S&Gs into all alternatives (see Chapter 4, Plan, Management Prescription IX).			
Recreation					
Issue #11					
How much of the Forests should be open, closed, or restricted to off-highway vehicle (OHV) use?	Open, Usable OHV acres:				
	Summer Acres:	239,175	256,120	243,020	220,195
	Winter Acres:	176,200	198,730	187,720	98,750
Issue #12					
How should the Forests supply water-oriented recreation facilities and opportunities to meet increasing demand?	None	Program direction for each alternative prescribes the degree of opportunities provided for water-oriented recreation. The opportunities are described in terms of support facilities such as developed sites, interpretive service, levels of operation, and miles of wild and scenic rivers. Alternatives PRF and RPA provide the most opportunities; Alternatives CUR and CBF provide slightly less.			

Table II-28
Disposition of Public Issues

Public Issue	Output or Effect to be Measured (1st decade unless otherwise noted)	ALTERNATIVE PRF	RPA	CUR	CBF
Riparian Areas Issue #13					
How wide should riparian management zones (RMZs) be and what management activities should be allowed within them?	None	The Riparian S&Gs found in Chapter 4 of the Plan would apply to all alternatives. They specify widths by class of stream, what the standards would be for the different RMZs, and they identify key watersheds and their more restrictive S&Gs.			
Special Areas Issue #14					
What areas should be recommended for Research Natural Area (RNA) and Special Interest Area (SIA) establishment?	Proposed RNAs Number of areas	9	5	8	13
	Acres	24,760	13,400	21,470	26,970
	Proposed SIAs Number of areas	19	13	9	15
Timber Issue #15					
Should herbicides be used to control vegetation in order to meet timber management objectives?	Release Acres/Year	4,000	4,300	4,700	3,700
		The total number of acres scheduled for release gives an indication only of the possible use of herbicides which may occur. All alternatives, except CBF, incorporate a full range of vegetation management treatment methods. These methods include mechanical, manual, prescribed burning, biological, and chemical. Selection of any particular method would be made at the project level, based on a site specific analysis of relative effectiveness, environmental effects and cost. Alternative CBF allows no chemical treatment methods.			
Issue #16					
What should the timber harvest level or allowable sale quantity (ASQ) be?	ASQ MMBF/Year	87.0	112.4	105.9	65.3
	Suitable land managed for timber (M acres)	575.3	638.1	635.8	495.4

Table II-28
Disposition of Public Issues

Public Issue	Output or Effect to be Measured (1st decade unless otherwise noted)	ALTERNATIVE PRF	RPA	CUR	CBF
Timber (continued)	1st decade harvest-Percent of Total Suitable Inventory	9.6	11.4	10.8	9.5
Issue #17					
What silvicultural practices should be used to assure reasonalby successful reforestation of harvested lands and to maintain tree species diversity?	Reforestation (Acres/Year)	4,600	4,700	5,200	4,100
		Based on National Forest Management Act guidelines, approximately 54,500 acres of land would be classified as unsuitable for timber production in all alternatives, because regenerability cannot be reasonably assured within 5 years after harvest. During the course of conducting reforestation activities, tree species diversity would be provided for by planting an appropriate mix of tree species, encouraging natural regeneration, and leaving advanced reproduction in harvest units.			
Issue #18					
What harvest methods, including clearcutting, should be used to meet management objectives?	Estimated clearcutting acres (1st decade)	300	3,810	3,160	0
	Estimated green tree retention acres (1st decade)	2,360	930	1,780	2,690
	Estimated selection acres (1st decade)	1,760	0	300	1,400
		Silvicultural systems would be determined by site specific prescriptions at the project level.			
Visual Quality **Issue #19**					
How and where should visual quality be protected and enhanced?		The direct environmental effects of the alternatives on visual quality include some change in visual appearance of the landscape in some areas of the Forest outside of wilderness and other areas where land disturbing practices are not allowed. These changes would be created by managed activities implemented to different visual quality levels. Land disturbing management activities would occur on a small portion of the land base as compared with the last 15 year average.			

Table II-28
Disposition of Public Issues

Public Issue	Output or Effect to be Measured (1st decade unless otherwise noted)	ALTERNATIVE PRF	RPA	CUR	CBF
Visual Quality (continued)		Overall, visual quality would improve in all alternatives; the greatest improvements would occur with Alternatives PRF and CBF.			
Wild and Scenic Rivers Issue #20					
What river segments should be recommended for inclusion in the Federal Wild and Scenic Rivers system?	Recommended National Wild and Scenic Rivers, new miles of National Forest Land only above the existing 106.4 miles.				
	Wild	42	0	0	56.8
	Scenic	17.3	0	0	25.1
	Recreation	2.9	0	0	34.7
	TOTAL	**62.2**	**0**	**0**	**116.6**
Wilderness and Roadless Areas Issue #21					
How should the Forests' roadless areas be managed, including the Mt. Eddy further planning area?	National Wilderness Preservation system acres	498,776	498,776	498,776	506,496
	Roadless Areas: Percent of acres retained in undeveloped condition.	81	71	72	88

Abbreviated Terms and Meanings

AMs	Animal Months
ASQ	Allowable Sale Quantity
M Acres	Thousand acres
MM$	Millions of Dollars
MMBF	Million Board Feet
OHV	Off-highway Vehicle
RMZs	Riparian Management Zones
RNA	Research Natural Area
S&Gs	Standards and Guidelines
SIA	Special Interest Area

CHAPTER III

Affected Environment

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CHAPTER III - Affected Environment

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III. AFFECTED ENVIRONMENT

Introduction

A

This chapter provides a comprehensive overview of the economic, social, and resource environments that would be affected or modified by the alternatives in this Draft Environmental Impact Statement (Draft EIS). The four alternatives under consideration were described in Chapter II. Careful study and examination of this chapter, along with Chapter II, are logical prerequisites to understanding the probable environmental consequences which would result from implementing each of the alternatives.

The discussions in this chapter are divided into three major sections: the economic, social, and resource environments.

Under each section, the discussion is in terms of public issues, the current management situation, including, where appropriate, supply and demand discussions, and management opportunities.

Resource discussions are presented in alphabetical order (e.g., "Air Quality" through "Wildlife.") This order is also consistent with Chapter IV--Environmental Consequences.

General Description of the Forests

B

The 2.1 million acres of the Shasta-Trinity National Forests lie in the heart of Northern California. Within the Forests' boundaries are a diverse and complex array of soil and vegetation types. At least four major physiographic provinces are represented on the Forests: (1) the Cascade Mountains, (2) the Klamath Mountains, (3) the Coast Range, and (4) the Sacramento Valley.

The Shasta-Trinity National Forests are located within four hours driving time of the San Francisco bay area and Sacramento population centers. The boundaries are but a few minutes drive from Redding, a city of nearly 70,000 people. Other population centers within the Forests' zone of influence include Burney, Dunsmuir, Hayfork, McCloud, Mt. Shasta City, and Weaverville.

Because of their geographic location and physiographic diversity, a variety of economic, social, and resource situations exists on the Shasta-Trinity National Forests.

The Economic Environment

C

Public Issue

What activities and outputs should be provided to maintain community stability? *(Public Issue #7).*

Discussion of Public Issue

Changes in the output of goods and services provided by the Forests can affect the stability of the local communities. As much as is practicable, output levels are maintained on a stable basis to avoid impacting these communities.

Output levels of many goods and services are coordinated on a local, regional and national level. Because of this, the actual level of some outputs may fluctuate from year to year.

Annual financial budgets are usually correlated with the level of outputs generated by the Forests. In other words, resource outputs at specified levels require a minimum level of funding.

Fluctuations in annual budgets may also affect the mix of goods and services. As budget levels drop below that required to produce a given mix of these goods and services, Forest, Regional, and National priorities associated with these outputs are reviewed. This review ultimately results in a revised mix of outputs consistent with the level of funding. Any specific output, depending on its relative priority, may or may not change as the overall mix changes.

Correspondingly, budgets in excess of the minimum required to produce a given mix of goods and services may also affect outputs. Upon review of current priorities, outputs may be increased. However, increased funding would not necessarily mandate an increase in historic outputs. Additional funding could be used to support new projects or provide for the development of new outputs.

Current Management Situation

The primary economic impact area associated with the Shasta-Trinity National Forests is comprised of Shasta, Siskiyou, Tehama, and Trinity Counties. Within this area Shasta, Siskiyou, and Trinity Counties are subject to the greatest economic influence from Forest activities. These three counties contain 96 percent of the Forests' acreage. The remaining acreage is located in Tehama County, with a small portion of land located in Humboldt and Modoc Counties. That portion of the Shasta-Trinity National Forests that is within Modoc County is administered by the Lassen National Forest.

To understand the role the Shasta-Trinity National Forests play in the economy of these Counties a discussion of the following elements is necessary: (1) economic efficiency; (2) shared receipts with Counties; (3) employment; (4) local unemployment; and (5) National Forest budget levels.

Statistics for these five elements were compiled prior to the listing of the northern spotted owl. The U.S. Fish and Wildlife Service (USFWS) formally designated this species as threatened on June 26, 1990. When applicable, discussions about each element will include two general time frames. One deals with historical information and another presents a scenario that considers the potential effects resulting from the listing of the spotted owl.

Sections dealing with the listing of the owl can be considered as updated information. However, the situation concerning the owl is highly uncertain and changing rapidly. As a result, definitive statistics on the economic environment affected by the listing of the owl are not available at this time.

Economic Efficiency

Allocating resources through management activities is an integral part of National Forest management. The efficiency of these allocations is a topic of concern. Commonly included within the topic of efficiency is the subject of economic efficiency. Economic efficiency typically entails receiving greater net returns over time when compared with net costs for the same period.

Actual costs of forest management activities are generally equal to the sum of individual expenses incurred to complete a task. Benefits of forest management activities can be considered as the sum of actual dollar returns received plus consumer surplus values. Consumer surplus values are intended to approximate the social benefits of goods over and above actual cash exchanged. Commonly referred to as "willingness to pay" values, consumer surplus values do not represent "real wealth" in that money does not change hands. However, many economists feel that consumer surplus values can be relevant to many social decisions.

One method of determining the economic efficiency of an activity is the calculation of its present net value (PNV). A PNV is equal to the discounted sum of benefits minus the discounted sum of costs for the same period of time, each derived over the life of the activity. Discounting benefits and costs to a base year permits the comparison of values originating over a series of years all at one point in time. A PNV greater than zero (i.e., a positive value) indicates that returns associated with a project exceed similarly associated costs. The relative size of this positive value can be thought of as a measure of a project's economic efficiency. A PNV of less than zero indicates that costs associated with a project exceed returns. A PNV of zero generally indicates a break even situation from an economic standpoint.

Economics are considered along with other decision criterion relating to management activities. Other decision criteria may outweigh economic criteria. For example, a decision to aid a segment of the population to achieve social goals may not be economical but may be preferred for other reasons. Because many resource "values" cannot be expressed in monetary terms, qualitative information must always be considered along with the quantitative values measured by PNV.

Historical Perspective

Values associated with recreation use as well as timber and water yields have formed the basis of benefits applicable to PNV calculations for the Shasta-Trinity National Forests. Costs associated with timber management, forest roads, and recreation and fire management have formed the cost side of PNV calculations. Potential output levels associated with timber and water yields and recreation use had remained relatively constant over the last five year period prior to the listing of the northern spotted owl.

Post-conservation Perspective

As a result of the listing of the northern spotted owl as a threatened wildlife species, potential timber yield levels on the Shasta-Trinity are expected to decrease significantly. Specific figures on what future yield levels would be for the Forests are unclear at this time. However, future yield levels could be one half or less of historic levels.

One effect of timber harvesting is a short term, or incremental, increase in total water yield from those acres harvested. Because future harvest levels are anticipated to be lower than historic ones, incremental increases in water yield from the Forests are expected to decrease in proportion to the number of acres not harvested.

Recreation use on the Forests has been relatively constant over the past several years. This trend is expected to continue.

Shared Receipts with Counties

A portion of the Forests' receipts (i.e., 25 percent of the total receipts) is paid to the State of California for distribution back to the counties where the National Forest is located. These funds are designated for the counties use on roads and for schools.

The percentage of a National Forest's total net acreage within a County is used to determine each County's share of total receipts. For example, Trinity County receives 89 percent of the "25 Percent Receipts" calculated for the Trinity Forest regardless of where on the Forest those receipts came from. The majority of receipts collected on the Shasta-Trinity National Forests is distributed to the tri-county area: Shasta, Siskiyou, and Trinity Counties.

A portion of the receipts collected by the Lassen National Forest is returned to Modoc, Shasta, and Siskiyou Counties as 25 percent payments from the Shasta National Forest. This is because the Lassen National Forest administers a portion of the Shasta National Forest.

Receipts subject to the 25 percent payment are directly related to the Forests' level of management activities. Historically, the Forests' timber management program generated the largest portion of shared receipts.

Historical Perspective

The pattern of shared receipts distributed among the counties is shown in **Table III-1**. This table depicts only those receipts attributable to the Shasta-Trinity National Forests. During the period shown, the Forests provided between 71 and 83 percent of Trinity County's total receipts and from 36 to 60 percent of Shasta County's. Forests other than the Shasta-Trinity contribute a larger quantity of shared receipts to Siskiyou and Tehama Counties.

As seen in **Table III-I**, shared receipts vary from year to year. Yearly variations aside, receipts distributed to Shasta and Siskiyou Counties have generally been between one and two million dollars annually since 1980. Trinity County's portion has fluctuated more widely, ranging from two to three million dollars annually between 1988 and 1992. A rising per unit value of timber and increased volumes as a result of the 1987 wildfires caused significantly higher receipts for Trinity County for that period.

Receipt to county variations have been historically reflective of many causes including changes in: interest rates, housing construction activity, varying bid rates for timber stumpage as well as fluctuating timber harvest levels.

Post-conservation Perspective

With the listing of the northern spotted owl, timber harvest levels on the Shasta-Trinity National Forests are significantly less than in the past. As published in the Shasta-Trinity National Forests' annual Timber Sale Program Report, per unit values paid for timber have been increasing since 1987. The combination of increasing

Table III-1
25 Percent Receipts by County
(Thousands of Dollars)

	FY 1988		FY 1989		FY 1990		FY 1991		FY 1992	
	From S-T	From All NF	From S-T	From All NF	From S-T	From All NF	From S-T	From All NF	From S-T	From All NF
Shasta	1,816	3,474	1,188	3,341	2,525	4,159	1,638	3,289	1,765	3,392
Siskiyou	1,613	6,694	1,018	8,547	2,302	8,341	1,500	7,094	1,620	7,166
Tehama	412	2,328	364	2,423	420	2,023	357	2,053	307	1,923
Trinity	5,752	7,366	4,882	6,945	6,172	7,461	5,044	6,540	4,507	5,779
Other	29	4,469	21	5,352	36	5,314	25	4,528	26	3,992
Total	9,622	24,331	7,473	26,608	11,455	27,298	8,564	23,504	8,225	22,252

unit values during a time of decreasing harvest levels may moderate some decrease in shared receipts.

For 1992 and 1991 payments to Counties were computed under a provision of the Interior and Related Agencies 1992 Appropriations Act and the 1991 Appropriations Act. For those National Forests affected by decisions on the northern spotted owl, a provision of the Acts provides for payments to States of not less than 90 percent of a five-year average of payments for Fiscal Year 1992 and a three-year average of payments for Fiscal Year 1991. Payments to the Counties would be lower if based solely on actual receipts.

Employment

Management activities also have the potential to affect employment patterns within the Forests' area of primary economic impact. These effects may be direct in nature such as Federal employment associated with the Forests. Direct effects may also be in the form of private employment necessary to support Federally solicited goods and services. In addition, commodities sold by the Forests may affect employment levels.

Indirect employment is commonly generated by businesses supplying goods and services required by direct employment. Using lumber mills as an example, local mechanics servicing mill equipment could be considered as indirect employment generated by the sale of sawlogs.

An induced effect is created by the wages generated through direct and indirect jobs as they are circulated throughout the local economy. These wages are often expended for food, housing, clothing, transportation and other living expenses. Induced effects may take the form of additional local employment created within existing businesses or the creation of new businesses. The sum of the direct, indirect, and induced effects is the total local economic impact in dollars (income) or jobs (employment).

Historical Perspective

Local Employment Patterns

Total employment and the relative percentage of total employment associated with specific industries is displayed in **Table III-2**. This table displays statistics for those counties located within the Primary Economic Impact Area and the State of California. Information for the years 1985 and 1991 is displayed to aid in identifying generalized employment trends. Comparisons of employment levels in similar industries can also be made within the counties listed and the State of California.

A review of **Table III-2** reveals several trends. All areas displayed have experienced a decrease in total employment within the lumber and wood manufacturing industry as well as the transportation and utilities and agriculture, forestry, and fisheries groups. Increases in employment within the wholesale and retail trade and services industry groups have occurred during the period 1985 through 1991.

The largest employing industry group in all areas listed is divided between the wholesale and retail trade group, services, and the government group. The second largest employing industry for the State of California, as well as Siskiyou and Trinity Counties, is the wholesale and retail trade group. The services group is the second largest employing industry in Shasta County. Government employment is the second largest group within Tehama County.

A number of shifts in areas of employment has occurred during the period displayed. Between 1985 and 1991, employment in the manufacturing industry group in the State of California has shifted toward services. While Government in Trinity County remained the largest employing group, the second largest group in this county shifted to the wholesale/retail trade group with a decrease in the manufacturing group.

Tehama County experienced a further shift away from manufacturing employment to the wholesale and retail trade. However, the relative difference between the percentages of employment within the top three industry groups in this County ranges from 20 to 24 percent. This close range may indicate that the top three groups are essentially equal in importance, rather than definitively ranked 1, 2, and 3.

Between 1985 and 1991Siskiyou County experienced a decline in manufacturing employment and a slight gain in the relative percentage of employment in the service industry.

Wholesale and retail trade remained the largest employing group within Shasta County. The services group increased slightly remaining second in relative ranking of employing groups during that period.

Employment Impacts

Local impacts of industrial activity attributable to the Shasta-Trinity National Forests (i.e., timber production, recreation use, Forest Service budget and range allotments) are estimated through the use of multipliers. Multipliers are commonly used for estimating regional economic and industrial impacts and are generally of two kinds: income and employment. As estimators, multipliers may not reflect actual conditions exactly, but they do help identify overall conditions. Employment multipliers are used in this document to model local

impacts. (See **Table III-4** "Employment Impacts by County.")

The timber industry uses sawlogs from National Forest lands and, therefore, is a primary industry affected by Forest Service activities. More jobs have historically been created in the timber industry as a result of Forest Service activities than any of the other industry sectors. As displayed in **Table III-4**, a relative shift to recreation has occurred due to the decrease in timber outputs. The majority of jobs have been created within Shasta County. This occurs because of a combination of direct, indirect and induced effects from within the County and surrounding counties. For example, a person might work at a mill in another county but do most of their shopping within Shasta County.

Several communities within the boundaries of the Shasta-Trinity National Forests are timber dependent. These are communities where a high percentage of the total employment is directly or indirectly related to the sale of timber from National Forests. The towns of Hayfork and Weaverville fall into this category.

Table III-2
Wage and Salary Employment
By Industry By County - 1985 & 1991
(Average Percentage)

	Shasta		Siskiyou		Tehama		Trinity		California	
Industry	**1985**	**1991**	**1985**	**1991**	**1985**	**1991**	**1985**	**1991**	**1985**	**1991**
Agriculture, Forestry, Fisheries	3.0	2.2	7.8	8.0	9.1	8.7	.8	1.6	3.0	2.1
Construction & Mining	6.0	7.5	3.5	4.0	3.2	3.2	5.0	3.3	4.8	4.4
Manufacturing	11.1	9.5	12.5	7.8	23.4	15.4	16.0	13.1	18.3	15.5
• **Lumber & Wood**	(4.6)	(4.2)	(10.5)	(5.9)	(16.5)	(7.9)	-	-	(.5)	(.4)
• **Other**	(6.5)	(5.3)	(2.0)	(1.9)	(6.9)	(7.5)	-	-	(17.8)	(15.1)
Transportation, Utilities	7.2	6.7	6.8	6.3	3.8	2.6	4.2	2.5	5.1	4.9
Wholesale & Retail Trade	26.0	26.8	21.9	21.9	19.5	24.0	14.3	17.2	23.2	23.2
Finance, Insurance, Real Estate	3.9	3.4	2.9	3.6	3.8	3.0	2.5	2.5	6.4	6.4
Services*	22.5	25.6	16.3	19.5	16.9	20.0	16.8	13.9	23.4	27.1
Government	20.3	18.3	28.3	28.9	20.3	22.4	40.4	45.9	15.8	16.4
• **Federal**	(2.9)	(2.2)	(7.0)	(6.3)	(2.3)	(2.2)	(10.9)	(10.6)	(3.0)	(2.7)
• **State**	(2.7)	(2.6)	(3.7)	(3.3)	(2.8)	(2.6)	**	**	**	**
• **Local**	(14.7)	(13.5)	(17.6)	(19.3)	(15.2)	(17.6)	(29.5)	(35.3)	(12.8)	(13.7)
Total Employment	--100%--		--100%--		--100%--		--100%--		--100%--	
Total Employment in 1,000s	**39.4**	**52.9**	**12.8**	**14.4**	**11.8**	**12.4**	**3.0**	**3.0**	**11,315.0**	**12,855.2**

Source: California Employment Development Dept., annual reports for Counties and State, 1987 and 1992.

* Includes recreation, tourism
** State and local, combined
Note: Percentages may not add up to 100 percent because of independent rounding.

Recreational opportunities on National Forest lands also contribute to primary industry activity. Attractions such as Mt. Shasta, the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area, and the Trinity Alps Wilderness generate over five million recreation visitor days per year.

Forest Service budgets impact industrial activity within and adjacent to the Forest boundaries. Much of this impact is by virtue of maintaining Forest Service installations and associated wages paid to employees. In addition, a large share of the Forest Service budget is distributed to local industries in the form of contracted work for road building, tree planting, and campground maintenance. Shasta County receives the largest impact associated with local Forest Service budgets.

Post-conservation Perspective

Local Employment Patterns

The employment patterns displayed in **Table III-4** are broad based and not tied to any one specific event or segment of an industry. Most of the larger term trends are expected to continue but loss of jobs in the timber industry is expected to accelerate.

Employment Impacts

Post-conservation employment, resulting from Forest Service activities, is expected to decrease significantly. This decrease is likely to result from lower timber harvest levels and from fewer contracts awarded for road building and tree planting.

A net decrease in the numbers of Forest Service employees is also expected to occur in response to lower timber harvest targets. This decrease will likely result in indirect and induced effects associated with a decrease in salaries expended within local economies.

Local Unemployment

That portion of the civilian workforce which is over the age of 16 and available for work but who did not work is classified as unemployed. Specific reasons for not working vary widely. Often the type of work performed contributes to the overall rate of unemployment during certain months of the year. These types of positions may be described as seasonal in nature and include many positions within agriculture, construction, and the lumber and wood products industries.

Historical Perspective

Average annual rates of unemployment for those counties within the primary economic impact area and the State of California are graphically displayed in **Table III-4**. As viewed in Table **III-3**, the average annual rate of unemployment for all areas listed has been declining; however, there was a slight increase in 1991.

The overall situation portrayed in **Table III-3** indicates that annual average unemployment rates in Shasta, Siskiyou, Tehama and Trinity Counties are generally twice the State average. An examination of the monthly data from which **Table III-3** is derived reveals that:

- Unemployment within the primary economic impact area is "seasonal" in nature rather than "secular" (a long term general trend). The highest rates of unemployment generally occur during the months of November, December, January, and February.

Table III-3
Unemployment Rate by County
(Annual Average Percent)

	1981	1983	1985	1990	1991
Shasta	15.1	15.6	13.3	8.4	10.3
Siskiyou	16.6	18.7	15.2	11.5	12.5
Tehama	12.6	13.5	11.5	10.7	12.4
Trinity	17.4	17.5	16.2	12.5	14.5
California	7.4	9.7	7.2	5.6	7.5

Source: State of California Employment Development Department: Labor Force, Employment, and Unemployment and Wage and Salary Employment, by Industry, 1984 and 1992.

- This fluctuating rate of unemployment is partially due to the seasonal nature of industries located in these counties. Included are the agricultural, construction and lumber and wood products industries as well as outdoor recreation.

- The larger and more diversified economy of the State of California is directly reflected in overall lower rates of unemployment. Unemployment rates exhibited by the State do not vary as much during the winter months as do unemployment rates within various counties.

Post-conservation Perspective

Unemployment rates can be expected to continue to respond to national and statewide economic conditions, including seasonal fluctuations. Reduced timber harvest levels for the Shasta-Trinity National Forests will contribute to short term unemployment levels.

It has been estimated that five jobs per million board feet (MMBF) of timber harvested are required for logging and sawmilling. Forest Service spending and receipt sharing create additional jobs. In addition, the spending and respending of salaries and purchases of equipment and supplies supports additional employment. In total, a short term impact of a reduction of 10 jobs per MMBF

Table III-4
Employment Impacts by Community

County / Community	Timber *	Recreation **	F.S. Budget	Range	Total Jobs
Shasta					
Anderson	138	77	-	-	215
Burney	74	39	-	-	113
Central Valley	102	39	8	-	149
Redding	310	807	48	-	1,165
Total	624	962	56	-	1,642
Siskiyou					
Dunsmuir	-	18	-	-	18
McCloud	18	13	8	5	44
Mt. Shasta	7	97	24	-	128
Weed	70	23	-	-	93
Total	95	151	32	5	283
Tehama					
Red Bluff	127	-	-	1	128
Total	127	-	-	1	128
Trinity					
Hayfork	121	99	16	-	236
Weaverville	91	162	24	1	278
Total	212	261	40	1	514
Totals	**1,058**	**1,374**	**128**	**7**	**2,567**

* Estimates by community based on the proportion of estimated timber volme processed by each mill from the Shasta-Trinity National Forests, adjusted for FORPLAN outputs by Region 5 California model multipliers. This procedure was modified for Shasta County to reflect the assumption that half the indirect and induced employment occurs in Redding.

in harvest levels is expected. Because the majority of the timber sold by the Shasta-Trinity National Forests is processed within its primary economic impact area, Counties within this area could be expected to incur these reductions in employment.

National Forest Budget Levels

The Forest Service budgeting process involves activities at the local, regional, and national level over an extended time period. For example, budget proposals are prepared by National Forest personnel two years in advance. These proposals are consistent with resource priorities and associated output levels. Proposals are also submitted in sufficient detail to delineate funding requests by specific appropriations. An appropriation can be defined as an authorization by Congress for the expenditure of monies for a specific purpose during a specified time frame. Individual Forest budget requests are then aggregated at regional levels and the regional budgets are, in turn, aggregated at a national level. The national aggregation of Forest and Regional budget proposals is then considered at an agency level by Congress.

The political climate in which the agency budget is considered potentially affects both the total level of funding as well as the mix of appropriations within a given level. Approved funds are commonly distributed back to the Forests two years after submission of initial requests. At the time funds are actually received, local, regional and/or national agency priorities may have changed. If changes have occurred from those requested, Forests are then required to reformulate their original proposals for budget execution according to the intent of the allocations. A result is that while resource needs are intended to drive the budget process, the budget must also be flexible enough to accommodate changes in political priorities.

Budget levels have fluctuated in the past and are expected to fluctuate in the future as well. However, the Forest Service is obligated to implement minimum resource protection measures specified by applicable Forest Plans while executing annual budgets and programs. Thus, Forests will implement minimum management requirements, the minimum implementation requirements, and the standards and guidelines as applicable. These requirements are all aimed at appropriate resource management combined with mitigation and monitoring requirements to minimize or eliminate impacts. (See Appendix H of the proposed Forest Plan for more information).

Management Opportunities

Several opportunities are associated with the Forests' economic environment.

Improving the economic efficiency of operations within the Shasta-Trinity National Forests is a continual reflection of forest management activities. The Forests can use information and analysis derived from this planning process to help emphasize those investments which improve economic efficiency.

Further quantifying the demographic characteristics as well as preferences of recreational visitors to the Shasta-Trinity National Forests can be of value to Forest managers. Examination of this type of information may assist in identifying opportunities to enhance and even expand recreational uses on the Forests.

D The Social Environment

Public Issue

There is no public issue concerning the social environment. However, a related issue has to do with cultural resources:

How should the Forests effectively provide identification, protection, and interpretation of archaeological, historical and religious sites? *(Issue # 1).*

Current Management Situation

Forest management activities have the potential to affect individuals within and adjacent to National Forest lands. The primary social impact area associated with the Shasta-Trinity National Forests corresponds with the primary economic impact area previously discussed. This social impact area encompasses Shasta, Siskiyou, Tehama, and Trinity Counties.

Areas within and adjacent to Siskiyou and Trinity Counties are predominately rural in nature. A number of settlements and small towns are distributed throughout these Counties. A large portion of Shasta County is also rural in nature. In addition, the city of Redding is located in Shasta County. Redding is considered an urban community, exhibiting a significantly larger resident population than other communities in the impact area.

Population Trends

Shasta County has historically maintained the largest population of the four counties comprising the primary

Table III-5
Population by County
(in thousands of people)

County	1960	1970	1980	1990	2000
Shasta	59.5	77.6	115.7	147.0	186.5
Siskiyou	32.9	33.2	39.7	43.5	48.4
Tehama	25.3	29.5	38.9	49.6	61.7
Trinity	9.7	7.6	11.9	13.1	13.8
California	15,567.0	19,971.0	23,771.0	29,760.0	36,259.0

Sources: 1960 - California Statistical Abstract, 1970.
1970 - Bureau of the Census, PHC 80-v-6, March 1981.
1980 - Census of Population, April 1, 1980.
1990 - Census of Population, April 1, 1990.
2000 - California Department of Finance, Report 91 P-1, April 1991.

social impact area. Through 1980, the Siskiyou County population exceeded the population of Tehama County. However, during the period from 1980 through 1990, population growth in Tehama County exceeded similar growth in Siskiyou County. As of the 1990 census, Tehama County's total population had surpassed that of Siskiyou County. Trinity County has historically maintained the smallest county population within the primary social impact area. Historical populations, as well as projected populations through the year 2000, are displayed in **Table III-5** "Population by County."

Population growth, listed as an average annual percentage change by decade, is displayed in **Table III-6** "Population Growth by County." As displayed, all counties within the primary social impact area realized an increase in population during the decade from 1971 through 1980. This sudden increase took place during the same period that the rate of increase within the State of California as a whole actually decreased (See **Table III-6.**) The annual average rate of population growth for these counties, during the decade from 1981 through 1990, decreased to approximately the level realized during the period 1961 through 1970. Projections of future growth (through the year 2000) anticipate a trend slightly less than the rate of growth experienced from 1981 through 1990.

Population Composition

Populations within the primary social impact area, when compared with the State of California, can be considered racially homogeneous in nature. This homogeneity is a direct result of between 86 and 91 percent of the populations within represented counties being made up of individuals within the white grouping.

However, a trend towards the diversification of the racial distribution within the primary social impact area can be viewed in **Table III-7** "Population by Racial/Ethnic Distribution of County." This local trend matches the general population trend within the State of California as a whole of moving towards greater diversification.

Hispanics are the second largest grouping represented after the white grouping. Native Americans, African Americans, Asian and Pacific Islanders and all others form the remaining groupings listed.

Social Categories

Individuals and groups of individuals are affected differently by Forest management activities primarily

Table III-6
Population Growth by County

County	1961-1970	1971-1980	1981-1990	1991-2000
Shasta	3.0	5.0	2.7	2.7
Siskiyou	.1	2.0	1.0	1.1
Tehama	1.7	3.2	2.8	2.4
Trinity	-2.2	5.8	1.0	0.5
California	2.8	1.9	2.5	2.2

because of different social linkages to the Forest. Social categories are used to describe the various linkages and effects of management activities.

Individuals within the primary social impact area have been grouped within several broad categories. These categories are not intended to represent specific social groups, but rather to serve as a means of describing social linkages and effects of Forest management activities. The Native American category, however, is an exception in that it can be considered descriptive of a social group. Social categories have been formed based on historical and projected trends of user groups, public hearings, informal interviews of Forest personnel and users, newspaper articles, other government studies and documents, use survey, and census data.

Individuals within these categories may hold similar or divergent personal values. Lifestyles exhibited may also be similar or divergent. A common bond which may be found in these categories is a general similarity in their feelings concerning the use of natural resources on National Forest lands. Individuals within the primary social impact area have been classified into a series of social categories.

Resource Utilization Emphasis Category. One broad classification is titled the Resource Utilization Emphasis Category. These are individuals who are directly or indirectly associated with the utilization/marketing of the natural resources located in the impact area.

An example of the Resource Utilization Emphasis Category is those individuals whose occupations and/or political activities are associated with the wood products industry. The consolidation of these individuals within several local communities has given rise to what could be classified as timber dependent communities.

Timber dependent communities are those where the social and economic situation of the community is intertwined with and dependent on the timber industry. Within these timber dependent communities several distinct occupational communities have been identified. An occupational community is a group of individuals who come "to share a common (or community) life set apart from others in society (Salaman 1974)." The occupational communities identified are "loggers," "sawmill workers" and "community businesses (Salaman 1974)." "Members of such communities will not only see themselves in terms of their occupational role, but will also value this self-image" (Salaman 1974). In this fashion, personal identities, as well as community and family ties, have been found to be directly related to vocations within the timber industry. It has also been found that differing occupational communities identify with the values of the particular community to varying degrees. In the examples above, loggers identify the strongest with their occupational community, while sawmill workers identified less and community business people identified the least.

The towns of Weaverville and Hayfork in Trinity County and Weed in Siskiyou County are examples of timber dependent communities. While timber plays a major role in these communities, secondary occupations dealing with the recreation industry and government industries also make significant contributions.

It should be noted that not all Resource Utilization Emphasis individuals reside within timber dependent communities. Others who are also oriented towards a Resource Utilization Emphasis reside in other locations within and outside the primary social impact area.

Individuals sharing a resource utilization emphasis viewpoint may be long term residents within the social impact

Table III-7
Population by Racial/Ethnic Distribution of County
(in thousands of people)

	Spanish Origin		White		Black		Native American		Asian		All Others		Total	
County	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Siskiyou	2.5	5.9	38.2	87.9	.7	1.6	1.7	3.9	.4	.8	<.1	0	43.5	100
Shasta	5.7	3.8	134.0	91.1	1.0	.7	3.6	2.5	2.6	1.8	.1	.1	147.0	100
Tehama	5.1	10.3	43.0	86.7	.2	.5	.8	1.7	.3	.7	<.1	0	49.6	100
Trinity	.4	3.3	11.9	91.0	.1	.4	.6	4.5	.1	.8	0	0	13.1	100

Source: California State Census Data Center, April 1990
Note: Population data may not add to totals because of independent rounding.

area (i.e., local residents for over 15 years, or relative newcomers to the area.) Many individuals within this category are retired workers.

As previously discussed, many residents of local settlements and small towns within the impact area have occupations which are dependent upon commodities produced from the National Forests. Often these individuals are from families who have been in the area for several generations. Loggers, millworkers, and community business people located in timber dependent communities are examples.

New residents have often immigrated from urban population centers. They have moved to this area for the rural environment including a lower cost of living, more recreational opportunities, and a slower pace of life. Some of these individuals hold professional occupations such as teachers, doctors and lawyers or are retirees and second homeowners. Others come in hopes of joining the local business communities but eventually leave the area due to limited opportunities.

Resource Amenity Emphasis Category. Another broad classification is titled the Resource Amenity Emphasis Category. These individuals typically value natural resources more for their amenity and symbolic values than their economic conversion values.

Natural resources within the area have a higher intrinsic value to these individuals than their potential conversion dollar values. For example, these individuals would prefer that local natural resource commodity items, such as timber, not be harvested but be retained for future generations. Concerns exhibited by this category of individuals often go beyond the actual production of specific commodities to include philosophies and strategies forming a potential policy basis for Federal land management.

These individuals may also be long term residents within the area or newly relocated residents from other areas. However, resource amenity emphasis individuals are generally not identified within occupational communities.

New residents who hold resource amenity emphasis viewpoints may be involved in a range of activities from local businesses to farming and/or mining. Some new residents can be considered as alternative lifestyle residents. These individuals are often seeking a simplified existence while practicing subsistence and/or commercial organic farming or mining.

Retirees and second homeowners are growing segments of the population in the study area. Some exhibit resource amenity emphasis values. Many of these individuals find that their economic stability is not tied to the use of natural resources as commodities. They value the Forests more for their recreation opportunities, particularly hunting, fishing, and boating.

These two categories of individuals, exhibiting Resource Utilization Emphasis and Resource Amenity Emphasis characteristics, view their lifestyle and quality of life as being interconnected with the natural resources. As individuals incorporate the ideals and, subsequently, identify with specific cultural values regarding various resource management practices, conflicts form because individuals hold differing views. These conflicts have been identified as major clashes in cultural values "with signs of growing into a class conflict" (Lee 1990). Class conflicts often polarize communities with individuals "taking increasingly rigid positions and organizing themselves on the basis of shared interests" (Lee 1990).

Recreationists. The Forests are also important to another large, diverse group of people: visitors and recreationists who do not live in the primary area of influence. Many live in the San Francisco/Sacramento area and value the opportunity to escape the urban environment for a weekend or more in the Shasta-Trinity National Forests. Water-oriented and back-country recreation, as well as hunting and fishing, are more important to this group than timber-related industries.

Preservation of the Forests' amenity values is a major concern of this group. Many of these individuals have a sense of ownership as strong as that of area residents and are often effective at lobbying for specific environmental issues.

Native Americans. Native Americans include American Indians, as well as those of Eskimo and Aleut ancestry. Native Americans indigenous to the area include the Hoopa, Yana, Wintu, Achuimawi, Shasta and Chirmariko. Many of these people still maintain traditional values and practices.

Native Americans commonly maintain a continuing interest in the Forests. In some cases, this interest is in the production of forest commodities to provide for continued employment opportunities. An example of these individuals are Native Americans who are also loggers. These individuals commonly hold a viewpoint similar to individuals exhibiting a resource utilization emphasis.

Other individuals are concerned with forest management practices as they may affect traditional commodities gained from the forest. The availability of these products for personal and/or spiritual use is of concern.

Native Americans, in some cases, are also concerned with National Forest outputs and management activities as they may impact traditional spiritual and/or religious activities. Religious systems as practiced by Native Americans may be considered "vastly different in many ways from the Christian traditions of the majority of

American society. . . . . Thus, land management practices that are not a burden to the mainstream beliefs and traditions may be a burden to the . . . Indian groups." (Theodoratus, 1984)

Management Opportunities

Clashes in cultural values have been identified between individuals holding Resource Utilization Emphasis viewpoints and those holding Resource Amenity Emphasis viewpoints. Controversies over timber harvesting versus protection of habitat for the spotted owl are examples.

This clash in cultural values has been found to show signs of an emerging "class conflict" (Lee, 1990). Participants in this conflict "are taking increasingly rigid positions and organizing themselves on the basis of shared interests" with potentially significant impacts on local societies (Lee, 1990).

Class conflicts have been known to emerge when conflicts between parties with unequal power have not been elevated to the public arena. Opportunities exist to assist local governments in moving this conflict to a broad public level. At this level, conversations between groups would permit the debating of issues to assist individuals in coping with change.

Public involvement in the management of National Forest resources is desirable and actively encouraged. In some cases, groups of individuals have not responded to requests for input into the forest management process. However, a lack of response does not necessarily mean that the individuals do not have valuable input or topics which they would like to discuss. Opportunities exist for Forest personnel to seek out these individuals. This would provide for individual contact as well as opportunities to establish and strengthen community ties between individuals and the Forests' management staff.

The Resource Environment
E

1. AIR QUALITY

Public Issue

No public issue focuses on air quality. However, there is one related issue. It is:

To what extent should prescribed burning be used as a way to reduce fuel hazards, prepare sites for reforestation, and improve wildlife habitat? *(Public Issue #5)*

Discussion of Public Issue

Prescribed Burning. Smoke produced by prescribed burning affects air quality and reduces visibility. Particulate matter and other compounds from smoke can also be hazardous to health. On the Shasta-Trinity, between 9,000 and 12,000 acres of fire hazards, logging slash, and wildlife habitat are treated through prescribed fire annually.

Current Management Situation

The air quality standard on the Shasta-Trinity National Forests is high. Forest activities which contribute to air quality degradation are: burning of forest vegetation, exhaust from vehicle and machinery use, and dust generation from logging equipment and other vehicular use of unpaved roads.

The Shasta Forest lies within two air basins, the Northeast Plateau and Upper Sacramento Valley. Most of the Trinity Forest is located within the North Coast Air Basin.

The three air basins within the Forests are in compliance with national ambient air quality standards. However, like most air basins in California, they exceed the California ambient air quality standard for PM-10 (particulates less than 10 microns in size). Primary sources for PM-10 include slash burning and dust generating activities.

Logging is the primary industrial activity that takes place on National Forest and private lands.

The primary Forest management activities affecting air quality are the burning of logging slash, burning for fuels reduction or wildlife habitat improvement, and vehicular dust generation on unpaved roads. Prescribed fire is usually the most economical way to get rid of unwanted concentrations of dead fuel.

Slash burning produces a mixture of the products of distillation, thermal decomposition, flaming and non-flaming combustion. J. Alfred Hall (1972)1 concluded that composition of the atmospheric particulate matter is similar to material entering the air through the normal process of vegetative decomposition. Fire compresses these processes into a much shorter time. The visible cloud of smoke from slash fires consists of water condensed on particulate matter and partly unburned carbon.

The temperatures attained in burning forest fuels are generally too low to permit formation of nitric oxide, a leading agent of photo-chemical smog. Temperatures sufficiently high for formulation of nitric oxide may be attained very briefly in explosions of concentrations of flammable gasses.

Smoke from burning forest fuels is substantially different in character and function from other forms of air pollution. For the most part, particles from fires of low or moderate temperatures are larger in size and shape than those from intense fires and high temperatures. Fires that burn under conditions of lower temperatures, wetter fuels, and higher humidities leave most of the charcoal and minerals on the ground.

The burning of forest fuels normally takes place at elevations above the Central Valley inversion layer (1,000 - 2,000 feet). At these elevations, the fires often have sufficient energy to drive their smoke plumes far above the layer of atmosphere that comes in contact with the surface. However, down canyon air drainage and thermal inversions in local basins may create transient smoke impacts in some areas. Emissions from the prescribed burning of woody fuels are less adverse than those from fixed continuous industrial sources because the production is short-term (usually less than 24 hours), seasonal, and occurs over different areas in succeeding years. When strict management practices are followed, little lasting effect on air quality results from the burning of slash.

1 J. Alfred Hall, Pacific Southwest Forest and Range Experiment Station, Forest Fuels, Prescribed Fire, and Air Quality, 1972.

Dust from vehicle traffic on unsurfaced roads is generally a short-term pollution hazard. Although air pollution from road dust is relatively insignificant, it can be annoying to the forest user.

The Yolla Bolly-Middle Eel Wilderness was designated as a Class I Air Quality Area by the Environmental Protection Agency and the Clean Air Act of 1963 as amended in 1977 (42 U.S.C. 7801) and in 1990. Because of this, management of the air quality in this area requires identification of air quality related values (AQRV) by measuring sensitive indicators of those values. Visibility, flora and fauna, and water have been identified as AQRVs. Subsequent assessment and monitoring indicators are necessary to determine whether or not the air quality is deteriorating. The Clean Air Act requires the Forest Service to comply with the substantive and procedural requirements of the State and local air pollution control agencies.

Interstate 5, which bisects the Shasta National Forest, has an annual average daily traffic rate of 13,200 vehicles per day as measured north of the Bridge Bay interchange. According to the California Department of Transportation (CALTRANS), this highway traffic does not create an air quality problem. Wind currents average 6 to 8 miles per hour from the south more than 75 percent of the time, and there is measurable air movement 95 percent of the time. Therefore, there is little opportunity for stagnation. The constancy of these air flows results not only from changes in weather conditions, but also from a diurnal airflow from the south during daylight hours, and a switch to the north during nighttime hours.

Management Opportunities

Periodic monitoring of ambient air quality will provide insights into the immediate air quality situation. For the Shasta National Forest, the closest point at which ambient air quality is monitored is at a California Air Resources Board Field Station in Redding. In addition, there is an air quality monitoring station in Yreka. The Shasta County Air Pollution Control District measures particulates. The CALTRANS District Office in Redding is equipped to measure ambient levels of pollutants along proposed transportation projects. Furthermore, construction of an air quality monitoring station is a proposed mitigation measure required for the construction and operation of the Mt. Shasta Ski Area. The station will be constructed within or in the vicinity of the permit area.

In Trinity County, where most of the Trinity Forest is located, there are no Air Resources Board Field Stations to measure ambient air quality. The Trinity County Air Pollution Control District measures particulates.

In order to better address air quality issues within and adjacent to the Yolla Bolly-Middle Eel Wilderness, monitoring plans should be formulated. Cooperation between the Shasta-Trinity and Mendocino National Forests will be required to meet this goal.

Predictions of future air quality, based upon a stationary and mobile emissions source inventory made in Shasta County in 1970, indicate that, although there will be a large increase in traffic, pollution controls will bring about a reduction in total emissions from fixed and mobile sources. Estimated maximum concentrations of all three constituents (carbon monoxide, hydrocarbons, and nitrogen oxides) will be reduced to and maintained below Federal standards.

Management goals for the treatment of logging slash are changing; therefore, decreased prescribed burning is foreseen. In the future, more slash will be left after timber harvesting to maintain soil quality and habitat diversity. There will also be an emphasis on better utilization of excess slash for biomass and firewood. These practices will result in less prescribed burning and in better air quality. There will also be greater coordination with local air pollution control boards. Increased partnerships can be more effective in meeting air quality standards and in finding better ways to reduce emissions from forest operations.

2. BIOLOGICAL DIVERSITY

Public Issues

Two major public issues focus on diversity. They are:

a. **How should the Forests' vegetative resources be managed for ecosystem diversity? Special consideration would be given to providing habitats that maintain or enhance populations of threatened and endangered (T&E) species and viable populations of sensitive species and/or management indicators.** *(Public Issue # 2)*

There is public concern that a wide variety of ecosystems should be maintained on the Forests to specifically provide for the:

(1) Maintenance and/or enhancement of habitats for Federally listed T&E species (plants and animals);

(2) Maintenance and/or enhancement of habitats sufficient to provide for viable populations of all other existing species (plants and animals);

(3) Maintenance and/or enhancement of the Forests' existing ecosystems and the biodiversity (plants and animals) associated with them; and

(4) Maintenance and/or enhancement of special elements or components of these ecosystems (i.e., snags, down logs, cliffs, vegetative seral stages, etc.)

b. **How much of the older vegetative seral stages existing on the Forests should be retained?** *(Public Issue #3)*

There is public concern that sufficient amounts of old growth habitats be retained and/or enhanced on the Forests to provide for the:

(1) Viability of all species (plants and animals) requiring this type of habitat for all or part of their lifecycle; and

(2) Sufficient representation and retention of this ecosystem component for the sake of maintaining vegetative biodiversity.

Discussion of the Public Issues

The public has increased its interest, concern, and awareness with respect to environmental issues, particularly those pertaining to concepts of ecosystems and biodiversity.

Ecosystem is defined as a complex ecological unit, including the biotic (living i.e., plants, animals) and abiotic (non-living i.e., soil, minerals, water, etc.) components and their relationships to each other. Such units are often divided into areas with similar attributes and named after the dominant vegetative type in the area such as a Douglas-fir community or ecosystem.

Biodiversity is the variance that may exist within the biotic components of an ecosystem(s).

The public has expressed concern about Forest Service activities and/or future management practices. The public is particularly concerned about activities which have altered or have the capability to alter the vegetative components (habitats and/or habitat attributes) of an ecosystem. The type, magnitude, location, and time in which the alterations have occurred and/or will occur represent the greatest concern.

Prior to 1900, natural and/or human-induced events such as wildfire, logging, and mining activities affected vast amounts of acreage. Such events often resulted in the loss, creation, and/or maintenance of edge, seral stages, and stand structure. In addition, the processes of disease and natural mortality have led to variations in stand attributes and species occurrence. All of these events have resulted in natural and human-induced fragmentation over small and large areas of Forest land. Unfortunately, little is known about the magnitude or pattern of these occurrences nor what constituted a "natural" existing situation 100-200 years ago.

Since 1906, an estimated 570,000 acres of Forest land have been burned. This represents an average of 6,560 acres per year. The largest acreage burned occurred between 1915-1935 (300,000 acres) and between 1985-1989 (170,000 acres). Portions of the McCloud and Hayfork Ranger Districts were the hardest hit. Over the last decade an average of 8,000-10,000 acres have burned each year by natural and human-induced causes.

Timber harvesting activities took place on an estimated 1,000 acres per year between 1920 and 1940. During the 1940s and 50s, harvest increased to an average of 1,500 and 5,000 acres per year, respectively. Since 1960, an estimated 10,000 acres have been harvested annually. Most of this harvesting has been regeneration cutting. An estimated 335,000 acres of suitable timber lands have been harvested on the Shasta-Trinity National Forests since 1910.

Some people are concerned that this level of vegetative alteration may lead to:

a. Fragmentation of habitats, loss of special components and/or attributes of diversity such as hardwoods, snags, dead/down material, older mature timber stands, riparian habitats, etc. Increased disturbance may also result to species using these components.

b. Loss of populations of threatened, endangered and sensitive (TE&S) species. (Refer to the sections on Botany and Wildlife/TE&S).

c. Loss of viable populations of various other non-TE&S plant and animal species such as Pacific yew or wildlife species associated with riparian habitats. (Refer to sections on Botany and Wildlife).

Related to the issues and concepts discussed above is the issue *(Public Issue #3)* of retaining sufficient amounts of older over-mature forests for the sake of their own retention as well as for the species dependent on or associated with them. For example, retention of older over-mature forests has value to some people whether or not species, such as spotted owls, live in these stands. Others argue that the economic value of the timber dictates that less acreage should be devoted to older over-mature stands. Most concerns focus on large, old conifer stands that have a high level of decadence.

Current Management Situation

General

Direction spelled out in the National Forest Management Act (NFMA) is to provide for diversity throughout the Forests in order to sustain the natural variety of plant and animal communities. Managing for diversity is important for the provision and maintenance of: (1) ecosystem stability; (2) biological variety; (3) fish and wildlife habitats; and (4) aesthetic values.

Two main assumptions can be made: (1) biological diversity (both plant and animal) is made possible through the application of project mitigation measures, Regional guide standards, Best Management Practices (BMPs), use of management indicators, land allocations, wildlife habitat relationships (WHR) and capability models; and (2) through the application of the above concepts, non-TE&S species will remain at viable levels.

Description of Current Environment(s) and Associated Management as Related to the Components of Biodiversity. Many of the components of diversity are or can be identified, displayed, and/or tracked through the California Natural Data Diversity Base (NDDB).

Diversity is evaluated according to three components: richness, evenness, and pattern.

Richness. The number of different kinds of elements found within the planning area, e.g., species, plant communities, vegetative seral stages, and special habitat components (snags, cliffs, hardwoods, dead and down material, etc.).

Evenness (and its Reciprocal--Dominance). The relative abundance of the animals, habitat types, successional stages, and cover classes within the planning area. Evenness describes the relative extent to which the proportional abundance of these elements is uniform.

Pattern. The structural (vertical pattern) and spatial characteristics (horizontal pattern) of the different elements, e.g., vegetation layers, patch size and shape, and the spatial distribution of plants and animals adjacent to each other within the planning area.

Richness

There are several broad ecosystems on the Shasta-Trinity National Forests: conifer forests, hardwoods, and chaparral. Within these ecosystems are many different vegetation types and associated special components such as riparian habitats, seral stages, snags, cliffs, caves, dead/down material, etc. This diversity helps provide habitat(s) for the needs of at least 370 species of wildlife either seasonally or on a year-round basis. Included are 240 species of birds, 85 species of mammals, 45 species of reptiles and amphibians and a variety of plant species (refer to Botany section). In addition, an unknown number of invertebrate and microbiological species exists on the Forests.

Intensively managed habitat types are discussed below. Habitat types which cycle naturally or under low intensity management are not discussed further, because they have little or no affect on naturally occurring diversity.

Conifers. Portions of four major coniferous forest types are intensively managed on the Shasta-Trinity National Forests: mixed conifer, Douglas-fir, ponderosa pine/Jeffrey pine, and red fir/white fir. Many of the Forests' wildlife species use them for breeding, feeding, resting, and travel from one area to another. Conifers occupy about 79 percent of the Forests' land base (refer to **Figure III-1**). Other common conifer forest types include lodgepole pine, knobcone pine, and digger pine. (Refer to the Timber Section for further information on these species).

Vegetative alteration takes place on about 25,600 acres per year (.5 percent of the Forests' vegetative land base.) This involves an average of 10,000 acres of natural and/or human-induced vegetative burning, 5,200 acres of regeneration harvest, 1,600 acres of sanitation/salvage, 2,800 acres of partial and intermediate harvests, and 6,000 acres of timber stand improvement and conifer release.

Coniferous habitats and/or habitat components (and the species associated with them) are retained through the standards and guidelines for snags and dead/down densities, percent retention of seral stages of major vegetation types, WHR analysis, management indicators and capability models.

These standards, guidelines, models, and concepts should be monitored and assessed to assure that they provide for retention of viable populations of plant and animal species.

Hardwoods. On the Shasta-Trinity National Forests hardwoods grow in pure and mixed stands on about 456,000 acres or about 9 percent of the land base (see **Figure III-1**). Many species of wildlife depend on hardwoods for foraging, especially the mast production. About 190,000 acres of hardwoods grow in fairly pure stands (158,000 acres on unsuitable timber lands and 32,000 acres on suitable lands.) The remaining 266,000 acres (104,000 on unsuitable timber lands and 162,000 acres on suitable lands) grow as mixed conifer-hardwood stands.

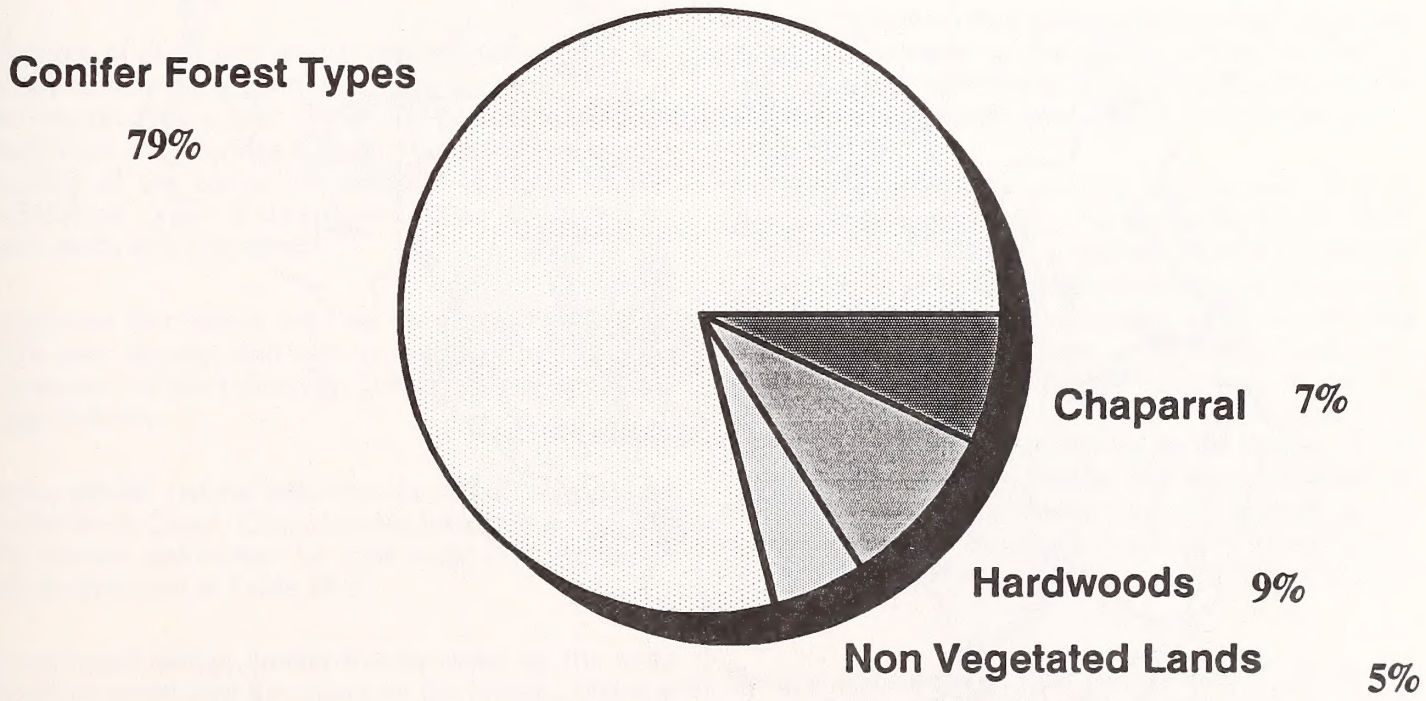
Hardwoods are divided into several types: black oak, live oak, and riparian woodlands. Common varieties include black oak (Quercus kelloggi), madrone (Arbutus menziesii), tanbark oak (Lithocarpus densiflora), canyon live oak (Quercus chrysolepis), and big leaf maple (Acer macrophyllum).

There is an opportunity to monitor and verify the use of hardwoods by wildlife to determine the habitat requirements needed to maintain viable levels of plant and animal populations.

Riparian Woodland. This type of vegetation grows where water runs intermittently or year-round. The most common hardwood species are alders (Alnus ssp.), cottonwoods (Populus ssp.), and willow (Salix ssp.). Various species of oaks and conifers may also grow within these areas. An estimated 85,500 acres of riparian habitat are scattered throughout all vegetation types across the Forests.

Management direction is geared towards managing riparian woodland areas (within a 50-100 foot band)

Figure III-1
Major Vegetation Types by Percent



primarily for the benefit of plant and animal species associated with this type. These areas provide key travel routes for many species while other species rely on them for their entire lifecycle. There is a need to monitor and verify use and retention of this special habitat type.

Chaparral. About 149,300 acres of pure chaparral stands grow on the Shasta-Trinity National Forests. It is estimated that another 60,000 acres grow under a sparse canopy of tree species. See **Figure III-2** for the location of chaparral cover types.

Chaparral is beneficial to wildlife (foraging, nesting, thermal, and escape cover), range (foraging and thermal cover), and watersheds (soil stabilization and increased water yields.)

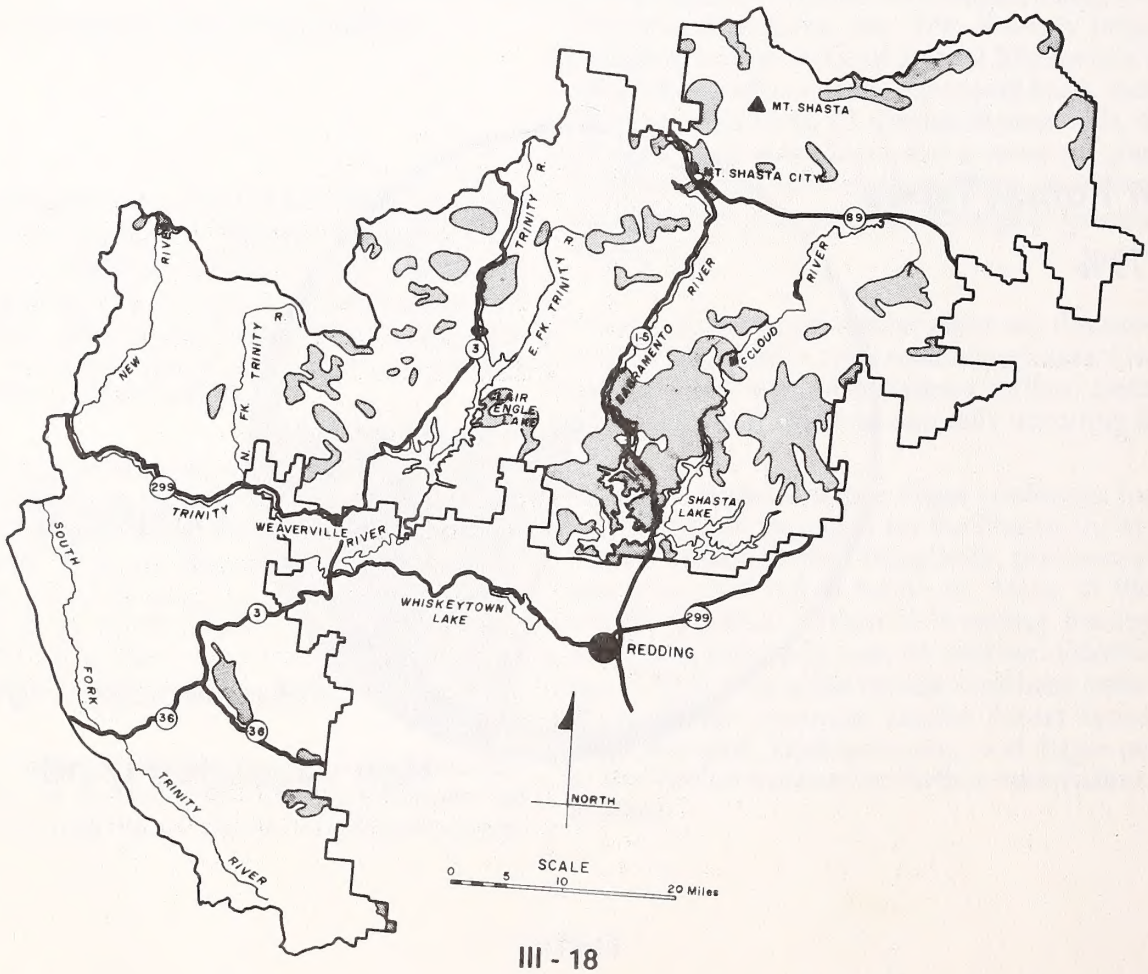
The Forests support two kinds of chaparral stands: (1) those that are successional climax in nature are usually found in dry, shallow, rocky soils at elevations between 1,000 to 4,000 feet; and (2) those that occupy the site because of natural or human-induced occurrences. These stands grow in deeper, more fertile soils at elevations ranging from 3,000 to 7,500 feet.

The composition of the different chaparral types is extremely varied. Several species of ceanothus are common. They are: wedgeleaf (Ceanothus cuneatus), lemon (Ceanothus lemmonii), snowbrush (Ceanothus velutinus), deerbrush (Ceanothus integerrimus), whitethorn (Ceanothus cordulatus), and squaw carpet (Ceanothus prostratus). Other common species include: manzanitas (Arctostaphylos spp.), bittercherry (Prunus emarginata), silk tassel (Garrya fremontii), Brewer's oak (Quercus garryana var. breweri), dwarf tanbark oak (Lithocarpus densiflora var. echinoides), chinquapin (Castanopsis sempervirens), chamise (Adenostoma fasciculatum), mountain mahogany (Cercocarpus betuloides), serviceberry (Amelanchier alnifolia) and bitterbrush (Purshia tridentata).

Bitterbrush is one of the more important browse or brush species for deer on the Shasta side. Bitterbrush grows on about 100,000 acres in stands by itself or mixed with other vegetation types. Most of this bitterbrush grows on deer summer range in the McCloud Flats area or on summer and/or winter range north and west of Mt. Shasta. Some of these bitterbrush stands are managed primarily for the benefit of wildlife.

Some bitterbrush stands are affected by timber management practices and wildlife and/or livestock grazing (primarily sheep).

Figure III-2
Distribution and Location of Forest Chaparral Cover Types



In cooperation with the California Department of Fish and Game (DFG), Forest personnel have been involved in prescribed burning of selected chaparral stands (1,000-2,000 acres per year) for the benefit of deer and other chaparral associated species. The majority of burning has occurred within deer winter range, although some chaparral and brush stands have been treated on summer range as well.

Natural Grasslands. About 11,000 acres of grasslands are scattered across the Forests. These areas are important for many species of wildlife and provide foraging and ecotone areas.

Grasslands are retained for the benefit they provide to wildlife. More of these early seral stage types may be needed on the Forests.

Special Components. The special components include snags, dead/down, older over-mature stands, hardwoods, etc. There are areas within the Forests where these components do not meet the existing standard(s).

Where deficits occur, management practices should be initiated to meet the required standards. Portions of the Mt. Shasta and McCloud Ranger Districts are areas of special concern with respect to snags, older over-mature stands, and dead/down materials.

Other. In addition to the vegetated lands, there are about 110,000 acres of non-vegetated lands comprised of rock or water (see **Figure III-1**).

Evenness

Evenness of plant and animal communities can be approximated by the proportion of each vegetation type on the Forests. **Figure III-1** shows the proportion of each major type and provides a good estimate of evenness. A majority of the Forest (79 percent) is in the conifer vegetation type. Sixteen percent is occupied by hardwoods and chaparral.

Vegetation formations may be further categorized by plant size, density, and age to evaluate the evenness component of plant diversity. This is referred to as seral stage diversity.

Seven wildlife habitat relationships (WHR) seral stages for the North Coast - Cascades area have been identified. The current distribution by seral stage and vegetation type is displayed in **Table III-8.**

As indicated earlier, conifer forests make up the most dominant vegetative formation on the Forests. Mid-size trees (11-21 inches diameter at breast height [dbh]) and large-size trees (over 21 inches dbh), with medium to dense canopies, make up the majority of the conifer forests. Numerous species make up the conifer forests' ecosystem, and each has environmental parameters that affect its range and location.

About 210,000 acres, or 10 percent of the vegetation on the Forests, are made up of stands which qualify as older over-mature habitat. About one-half of the older over-mature habitat grows on suitable timber land and one-half is on unsuitable lands.

An estimated 13 percent of the vegetation on the Forests is in early seral stages (1 and 2), 45 percent is in mid-successional, and about 34 percent is in the mature or later successional stages. Another 8 percent is in pure or mixed hardwood stands.

Current management direction provides for a minimum of 5 percent of each identified seral stage within each major vegetation type. This is accomplished through a project-by-project assessment.

The standards and guidelines should be monitored and verified to provide for an appropriate level of evenness of vegetative diversity and its relationship and need as related to wildlife species.

There is also a need for a better inventory and tracking mechanism for the older over-mature component on the Forests as it relates to its abundance, distribution, and patch size.

Pattern

The existing pattern of vegetation types, seral stages, and special components varies widely across the Forests. Pattern has been affected by recent (last 30 years) as well as by past management practices or natural causes.

The most predominant areas of pure hardwoods grow within Wildernesses and in areas on the Big Bar, Hayfork, Yolla Bolla, and Shasta Lake Ranger Districts. Concentrations of brush or chaparral grow within the Trinity Alps Wilderness, south of Hayfork Valley, along the east side of the Yolla Bolla Ranger District, and on the Shasta Lake District adjacent to Shasta Lake. Large areas of mature, mixed conifers grow on McCloud, Hayfork, and Yolla Bolla Ranger Districts. Approximately 50 percent of the Shasta-Trinity National Forests has been classified as tentatively suitable for timber and 50 percent as unsuitable for timber. This situation allows for a high degree of interspersion of intensively and extensively managed lands.

The size and location of the Forests' broad ecosystems will not change significantly over the next 50 years. Even the size and location of vegetation types will not change

Table III-8
Acres of Vegetation Types by Wildlife Habitat Relationships (WHR) Types

WHR Seral Stages*	1	2	3A	3B&C	4A	4B&C	4C-older	Total	Percent
Major Conifer Types									
Mixed Conifer	53,744	37,085	301,430	477,500	140,833	294,900	155,500	1,460,991	69
Douglas-fir	1,694	4,580	598	1,793	0	2,590	15,542	26,797	1
Red Fir/White Fir	1,694	1,793	3,885	22,914	3,885	26,200	38,755	99,127	5
Ponderosa Pine/Jeffrey Pine	797	3,587	3,885	15,442	3,088	9,265	0	36,065	2
Sub-total	**57,928**	**47,045**	**309,799**	**517,649**	**147,807**	**332,956**	**209,796**	**1,622,980**	**77**
Other Conifer Types	0	0	299	32,216	0	8,767	0	41,282	2
Hardwoods	0	18,829	56,687	56,687	18,829	37,858	0	188,892	9
Chaparral	0	148,742	0	0	0	0	0	148,742	7
Grass	10,560	0	0	0	0	0	0	10,560	0
Total Vegetated Land **	**68,488**	**214,617**	**366,785**	**606,553**	**166,636**	**379,581**	**209,796**	**2,012,456**	95
Total Non Vegetated Lands								**109,091**	5
Total Forest Acres								**2,121,547**	**100**

* **Seral stages based on the following criteria:**

1 = Grass/forb stage consisting of annual and perennial grasses and forbs, with or without scattered shrubs and seedlings.

2 = Shrub/seedling/sapling stage consisting of mixed or pure stands to 20 feet in height.

3A = Pole/medium tree stage (5-21 inches dbh) including larger trees in the size range 20 to 50 feet in height. Total tree canopy cover is from 10 to 39 percent. Stands commonly support a substantial shrub layer.

3B&C = Pole/medium tree stage (5-21 inches dbh) including larger trees in the size range 20 to 50 feet in height. Total tree canopy cover is 40 percent or greater. Shrub layer is variable.

4A = Large tree stage (greater than 21 inches dbh) corresponding roughly to a mature and over-mature classification generally over 110 years of age. Trees generally exceed 50 feet in height, except some of the oak types at lower elevations. Total tree canopy cover is from 10 to 39 percent. Stands commonly support a substantial shrub layer.

4B&C = Large tree stage (greater than 21 inches dbh) corresponding roughly to a mature and over-mature classification generally over 110 years of age. Trees generally exceed 50 feet in height, except some of the oak types at lower elevations. Total tree canopy cover is 40 percent or greater. Shrub layer is variable.

4C-older = Multi-layered large tree stage (greater than 21 inches dbh) with obvious signs of decadence. Dominant trees are over 180 years of age. Total tree canopy cover is 70 percent or greater.

** **Includes an estimated 85,500 acres of riparian habitat scattered throughout all vegetation types.**
NOTE: The sum of the columns may not add up exactly because of independent rounding.

significantly. The amount and pattern of structural diversity is constantly being altered by wildfire and Forest management activities. This alteration of habitat is beneficial and important to some species of wildlife and adverse to others. Forest personnel have limited control over wildfire, but they do manage for a variety of successional stages with prescribed burning activities.

Management practices allow for the alteration of vegetative patterns within areas being intensively managed. This leads to a change in the size and location of different stands or seral stages of certain vegetation types. Forest personnel do not have a thorough understanding of the effects of fire and timber management activities on concepts such as fragmentation, loss of interior wildlife species (due to reduction in size of stands), adverse increases in amount of edges, etc. These are very difficult concepts to understand, assess, and manage on the ground. Present management attempts are being made to address these and other related concerns through the application of a Shasta-Trinity Supplement, WHR, and associated capability models. There is a strong need to assess and verify that the application of such standards and guidelines is appropriate and sufficient in magnitude. Forest specialists believe that present management practices provide viable populations of all non-T&E species.

The status of the northern spotted owl (NSO) was recently changed from sensitive to threatened. This, coupled with the Interagency Scientific Committee (ISC) Report and the listing of critical habitat units (CHU) for the NSO, has resulted in major changes. These changes relate directly to all three concepts of biodiversity: (1) 535,000 acres of vegetated land have been placed in habitat conservation areas (HCAs); (2) in addition to the base HCA acres, about 121,000 acres were designated as CHU outside of HCAs. It is estimated that 50 percent of these two categories of land fall within areas previously designated for timber management activities; (3) the establishment of a 50-11-40 rule (result of ISC report) indicates that one half (50 percent) of the portion of every quarter township, which is suitable or has the capability to produce suitable NSO habitat within a reasonable amount of time, provide for timber stands with an average dbh of 11 inches and an average crown closure of 40 percent. These two concepts have or will significantly change the pattern and evenness concepts of biodiversity from those which were planned.

Management Opportunities

When managing the Forests in the future, care must be taken to: (1) provide for the maintenance of existing special components; (2) insure adequate biological variety; (3) maintain the existence of all native vertebrate fish and wildlife species found on the Forests; and (4) manage for a diverse flora representing all stages of existing vegetation well distributed in time and space over the Forests. The opportunity exists to try and meet the 5 percent minimum for seral stage one for species enhancement on many areas within the Forests. The opportunity also exists to apply the concepts of ecosystem management in order to help provide for various concepts of biodiversity.

There are opportunities to provide diversity through existing management direction and the creation of standards. These standards would pertain to levels of snags, dead/down material, hardwoods, road densities, corridors and their widths, percent seral stage retention, size, location and pattern of managed units, rotation lengths, etc. Implementation of a monitoring program for these components of diversity would then verify if they were working as intended.

The retention of a reasonable amount of older over-mature habitat should be distributed across the Forests. To help meet older over-mature stand needs in deficit areas, younger stands can be identified and protected for future old-growth development.

There is a need to manage for better distribution and amounts of snags and dead/down material in areas on the Mt. Shasta and McCloud Ranger Districts.

There are opportunities to lessen the effects of timber harvesting on habitat diversity through the location, design, and type of harvest units. For example, smaller openings would normally create a more diverse habitat than larger openings. Diversity can also be enhanced by rejuvenating over-mature and decadent browse species, such as bitterbrush, to maintain and enhance summer deer range.

Since chaparral management is receiving increased emphasis, greater management opportunities exist, especially with respect to wildlife. These opportunities are best realized through coordinated resource management plans (CRMP) and other cooperative programs which include private landowners, the California Department of Forestry and Fire Protection (CDF), Department of Fish & Game (DFG), and/or other interested agencies or groups. Such coordinated efforts help reduce costs and may increase the size of treatable areas. New air quality standards could affect this program by reducing potential opportunities.

Hardwood stands could be managed and enhanced through the use of various silvicultural treatments including thinning, release and regeneration harvest or prescribed fire. There is a need to develop a five year fish/wildlife program management plan to help implement future plans, to budget such efforts, and to monitor results.

3. BIOMASS

Public Issue

There is no major public issue relating to biomass. However, there is concern that the removal of large amounts of woody material could have adverse effects on other resource values such as soils, watershed, and wildlife habitat. Increased biomass removal for wood fiber power plants could also reduce the availability of firewood for personal use.

There is also concern that prescribed burning of logging debris is detrimental to other resource values and should be reduced. This issue is discussed in the Fire and Fuels section *(Public Issue #5)*.

Current Management Situation

For purposes of this document, "biomass" is the aboveground portions of shrubs and trees, excluding material that meets commercial sawlog specifications. Biomass includes logging debris from timber harvest operations (cull logs and hardwoods), material from pre-commercial thinnings, brush such as manzanita, dead and down material, and non-commercial timber species such as digger pine.

Almost all biomass is the result of timber harvesting activities. The prevailing practice has been to dispose of this material by rearranging and/or burning.

Biomass is found throughout the Forests, but its availability is limited by factors such as slope, distance from roads, type and density of stands, and competing demands.

Conversion of biomass into electrical energy has been hampered by the cost of transporting the material and because the facilities needed to process it are inadequate.

Supply. Most of the biomass used in local wood fiber power plants comes from private timberlands and sawmills.

Recent inventories of biomass material on the Forests have been conducted as part of fuel loading studies. These inventories indicate that quantities of biomass vary greatly from site to site. It is not uncommon to find in excess of 50 tons per acre on many harvest units after logging.

Most available biomass material is generated from logging debris. Additional biomass comes from precommercial thinning activities and brushfields. In addition, significant amounts of biomass (both conifers and hardwoods) are located on non-commercial forest land. Since few or no timber management activities are planned, biomass would normally not be available for removal.

It is anticipated that the amount of biomass available for generation of electricity would not interfere with the demand for firewood. This assumption is based on the continuous supply of biomass that would be produced from timber harvest activities.

Forest personnel can make wood fiber material available and encourage its removal. However, they cannot create a market for it or ensure that biomass is actually removed and used for energy purposes.

Demand. The existing demand for biomass is in the form of hardwoods for firewood. Relatively little of the available biomass on the Forests is being used to generate electricity. However, this use is increasing due to the construction of new power plants.

Nine wood fiber power plants could draw biomass material from the Shasta-Trinity Forests. These plants are located in Burney, Hayfork, Anderson and the Redding area. No additional wood fiber power plants are planned for this area. The fuel requirements for these plants are about 1,640,000 bone-dried tons per year.

Most of these plants are connected to lumber mills and rely heavily on mill waste rather than forest residues (biomass). Estimates indicate that less than 20 percent of the material required by these nine plants is currently being supplied from forest residue. This is expected to increase to over 50 percent within the next few years.

The demand for wood fuel for power plants is greater than supply. It is unknown what the future demand for biomass will be. However, the demand will most likely be met by the Shasta-Trinity National Forests, other National Forests in the area, and private lands.

Management Opportunities

The Forests can provide incentives, through contracting and modifications to the timber sale contract, which would encourage the removal and utilization of greater amounts of biomass material.

Special management considerations may be necessary to mitigate conflicts between personal firewood use and biomass use for wood burning power plants. This could include special management zones, especially near

forest communities, where firewood use would have priority over biomass use.

The removal and use of biomass can produce related benefits: (1) potential loss from destructive wildfires can be reduced; (2) new employment can be provided; (3) air quality can be improved because of less acreage and material needing prescribed burning; (4) land productivity can be enhanced; and (5) wildlife browse and range opportunities can be increased.

Biomass plays a major role in forest ecology. Its ecological functions include recycling nutrients to the soil, increasing the soil's moisture holding capacity, and providing habitat for plants and animals.

4. BOTANY

Public Issue

One public issue relates to threatened, endangered, and sensitive (TE&S) plants:

How should the Forests' vegetative resources be managed for ecosystem diversity? Special consideration would be given to providing habitats that maintain or enhance populations of threatened and endangered (T&E) species and viable populations of sensitive species and/or management indicators *(Public Issue #2)*

There is public concern that a wide variety of ecosystems should be maintained on the Forests to specifically provide for the:

a. maintenance and/or enhancement of habitats for Federally listed T&E species (plants and animals);

b. maintenance and/or enhancement of habitats sufficient to provide for viable populations of all other existing species (plants and animals).

Discussion of Public Issue

Species richness is one component of biological diversity. Identifying and conserving habitat for the rarest plant species on the Forests is one aspect of maintaining botanical diversity. The Shasta-Trinity National Forests' TE&S program focuses on three categories of rare plants:

a. Plants listed by the U.S. Fish and Wildlife Service (USFWS) as **Threatened or Endangered** under the auspices of the Endangered Species Act. Management and recovery of these species is governed by the provisions of that Act. Consultation with the USFWS is required if there is a potential for adverse impacts to listed species or their habitats on National Forest lands.

b. Plants listed as **Sensitive** by the Regional Forester. This list includes Federal candidates for listing under the Endangered Species Act, State-listed species, plants on lists 1 and 2 of the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California, and plants tracked by the California Natural Diversity Data Base. These species are managed in accordance with Pacific Southwest Region (Region 5) policy.

c. Plants **endemic** to the Shasta-Trinity National Forests that are not listed as TE&S. These are species for which all or nearly all populations lie within the boundaries of the Forests. Management policy is developed at the Forest level. Most of these plants are on list 4 of the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California.

Because of restricted natural ranges or low population numbers, rare species are vulnerable to habitat changes brought on by human activities. This is particularly true of endemics and outlying populations at the edges of a species' range.

Threats to rare plants on National Forest lands can include road building and maintenance, excavation of rock sources, grazing, logging, changes in hydrology, herbicide use, fire suppression activities, and plant collecting. Not all plants respond in the same way to these impacts. In fact, about 20 percent of the sensitive plants on the Forests rely on wildfire or other disturbances for maintenance of their habitat.

Since wildfires have been systematically suppressed on National Forest lands for the last five decades, these plants now rely on other natural and human-caused disturbances for their habitat. Management of these disturbance followers requires identification of the degree and interval of disturbance needed to promote species survival. Species management guides must be tailored to address the particular factors affecting the success of each species.

The sensitive and endemic plants of the Shasta-Trinity National Forests are disproportionately concentrated in a relatively small number of special habitats such as serpentine barrens, montane meadows, and limestone outcrops. Management for maintenance of sensitive and endemic plants, therefore, conserves these special habitats, but is less effective for conserving the whole spectrum of habitats on the Forests.

Current Management Situation

Threatened/Endangered

At present, no plants on the Shasta-Trinity National Forests are Federally listed as threatened or endangered.

Sensitive

Forty-two species, or approximately 2 percent of the native flora of the Forests, are on Region 5's sensitive species list. One third of these are endemic to the Shasta-Trinity National Forests; that is, they do not occur

anywhere else. The majority of these endemics are restricted to serpentine soils.

Management and protection of sensitive plants is accomplished through identification and inventory of suitable habitat, surveys of project areas for potentially affected populations, protection of habitat, and population monitoring. It may also include manipulation of habitat to increase or stabilize populations. Information on the locations, numbers, and habitats of sensitive plants is shared regularly with the California Natural Diversity Data Base.

The Forests' sensitive plants include two State-listed species: Brandegee's eriastrum (Eriastrum brandegeae), listed as rare, and Trinity buckwheat (Eriogonum alpinum), listed as endangered.

Eriastrum brandegeae has been observed on the Trinity National Forest in open xeric chaparral on the alluvial bottom of Hayfork Valley. One population occurs on a portion of the isolated Forest Service compound on the northeast end of town. Apparently there is no additional suitable habitat for this species on the Forests. Unless further study reveals otherwise, efforts to sustain viable populations may be limited to protection of this existing population. This species is more widespread to the south, on and adjacent to the Mendocino National Forest.

Eriogonum alpinum is found above 6,400 feet on soils derived from serpentine in the Eddy Mountains. This species is endemic to the Shasta National Forest.

Refer to Appendix G for a listing of sensitive plants found on the Forests.

Endemics

As noted above, about a third of the sensitive plants on the Forests are endemics. In addition to these, two plants are endemic to the Trinity National Forest, and two are endemic to the Shasta National Forest. The Trinity endemics are Dubakella Mountain buckwheat (Eriogonum libertini) and serpentine haplopappus (Haplopappus ophitidis). Both are restricted to serpentine soils. The Shasta endemics are Shasta eupatory (Eupatorium shastense), a limestone endemic, and veiny arnica (Arnica venosa).

All four of these endemics were listed as sensitive at one time, and they were managed as such. Since their removal from the Regional sensitive plant list, they have not been systematically surveyed for, nor have they been protected. In the future, endemics will be surveyed for, mapped, and avoided where possible. In addition, habitat management plans will be developed for endemics according to the schedule set forth in Appendix A of the proposed Forest Plan.

Management Opportunities

Opportunities exist for acquiring more and better information about rare plants on the Forests. Forest personnel will continue to share rare plant locality and population information with the California Natural Diversity Data Base, the California Native Plant Society, adjacent Forests, the Bureau of Land Management, and other interested agencies and individuals. Further survey work is needed for most sensitive species. Comprehensive surveys, in conjunction with the development of Species Management Guides, are planned according to the schedule set forth in Appendix A of the proposed Forest Plan.

While all sensitive plant populations are protected under Prescription VII (Threatened, Endangered, and Selected Sensitive Species), areas with concentrations of rare plants may benefit from designation as Special Interest Areas (SIAs). Several botanical SIAs have been recommended for establishment in the proposed Forest Plan. For a few species whose populations are largely in private ownership, land acquisition may be appropriate as a protection tool. Acquisition of specific parcels for protection of sensitive plants is recommended in the Supplemental Management Direction sections for several Management Areas (see Chapter 4 of the proposed Forest Plan). Habitat manipulation may be needed to maintain or create habitat for disturbance-dependent plants. This approach is being used with Cooke's phacelia, a sensitive plant. It may also be used for other species once their disturbance requirements are known.

In addition to information sharing among agencies and private groups, opportunities also exist for cooperation in species management. For instance, two Species Management Guides were developed in 1990 under cooperative agreements with The Nature Conservancy. The Shasta Chapter of the Native Plant Society has assisted with sensitive plant monitoring. Boundaries of the four recommended Botanical Interest Areas along the Scott Mountain crest, dividing the Shasta-Trinity and Klamath National Forests, were coordinated with the Klamath. These partnerships will be expanded in the future.

5. CULTURAL RESOURCES

Public Issue

One public issue relates to cultural resources:

How should the Forests effectively provide identification, protection, and interpretation of archaeological, historical, and religious sites? *(Public Issue #1)*

Discussion of Public Issue

How the Forest Service manages cultural resources is a concern with several publics, including the Native American community, the State Historic Preservation Office (SHPO), and professional archaeologists and anthropologists. Native American communities have raised several questions including: (1) how is the Forest Service protecting its religious places? (2) should archaeologists be allowed to disturb burials in prehistoric Indian sites? and (3) will sacred objects and skeletons, excavated from Federal lands, be returned to them?

The SHPO has expressed concerns that the Forest Service does not fully comply with Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR 800. The SHPO's concerns include such things as failing to adequately inventory undertakings such as timber sales; failing to evaluate cultural resources for the National Register of Historic Places; and failing to include Native Americans as "interested parties" in the formal consultation process.

The professional community, including archaeologists, anthropologists, and historians, has an interest in how cultural resources are conserved on the National Forests in California. They have expressed the following concerns: not enough historic properties are being nominated to the National Register of Historic Places; historic buildings, such as lookouts, need to be preserved; archaeological sites are being looted at an alarming rate; and archaeological sites continue to be disturbed by project activities regardless of the protection methods used.

Current Management Situation

In assessing the present management situation for the proposed Forest Plan, Shasta-Trinity National Forests' personnel awarded contracts to several professional anthropologists and archaeologists (Bauman, 1981; Martin and Hodder, 1981; Theodoratus Cultural Research, 1981; and Theodoratus Cultural Research, 1984). These individuals prepared overviews concerning history, Native American religious places and uses, prehistoric archaeology, ethnography, and Native American languages. The completed documents present a comprehensive picture of culture, history, land use, and current ethnic and professional concerns.

Information has also been solicited from people associated with local historical societies (Shasta, Siskiyou, and Trinity Counties), academic institutions (Shasta College and California State University at Chico), the SHPO, and the Native American community.

As of 1990, several hundred thousand acres of the Forests had been surveyed for cultural resources, and about 2,650 historic and prehistoric cultural resources had been recorded. Most of those inventories have been conducted for timber sales; other areas (e.g., wildernesses) have been inventoried to a much lesser extent. Less than half of the recorded cultural resources have been formally evaluated for the National Register of Historic Places, and about 500 have formally been determined to be eligible, in consultation with the SHPO. In addition to the recorded historic and archaeological sites, several ethnographic studies have identified thousands of Indian "placenames" within the Shasta-Trinity National Forests. However, many of these cannot be physically located with any degree of precision.

The inventory and evaluation of cultural resources has been guided by two research orientations that have been termed "cultural ecology" and "the direct historical approach." The former is concerned with how societies, through time and space, have used culture to adapt to changing or static environments. The latter involves studying the history of a particular ethnographic group, such as the Wintu of the Redding area, by using the written historical record to interpret archaeological remains. Both approaches seem particularly appropriate to the Shasta-Trinity National Forests, since there is a diverse and well documented ethnographic record and multiplicity of environments that must have fostered variable adaptive responses. The two-fold research orientation revolves around the subject of land-uses and requires detailed chronological and environmental data, as well as a thorough understanding of prehistoric technologies.

The California Inventory of Historic Resources (State Plan), 1976, listed nine themes for the State. The various sites recorded in the Forests so far are representative of all these themes (e.g., Aboriginal, Architecture, Government, etc.). The California inventory lists several places in or immediately adjacent to the Forests: Bass Hill, Battle Rock, Lake Britton Archaeological District, Southerns Stage Station (Shasta County); Strawberry Valley Stage Station (Siskiyou County); International Organization of Odd Fellows (I.O.O.F.) Hall, Comet Lodge No. 84 (Trinity Center), La Grange Mine (Trinity County), and Weaverville Historic District (Trinity County).

The historic overview prepared for the Forests identified a number of themes which highlights events of the last 150 years. The earliest theme identified was exploration, beginning in the 1830s. The first explorers were fur trappers. During the 1840s, several military expeditions, such as that of John C. Fremont, passed through the Forests. Beginning in 1848, with the discovery of gold by P.B. Reading, Shasta and Trinity Counties witnessed the first significant population influx. As gold mining expanded, other historic themes became important, such as commerce, transportation, and homesteading.

By the 1870s, trails, stage routes, and wagon roads were established throughout much of the Forests. These early endeavors culminated in 1887 with the completion of the Central Pacific Railroad linking Oregon with California. The completion of the railroad and other transportation routes set the stage for several other historic themes that characterized the next few decades: lumbering, recreation, and mining. The construction of the railroad created a demand for wood products, as well as a haul route to larger markets, thus stimulating production even more.

Early recreational use in the Forests was associated predominately with resorts, typified by those along the Upper Sacramento River. Mining activities continued off and on during the last decade of the 19th century. They reached a peak between 1895 and 1920 with the development of copper mines and smelters in the vicinity of present-day Shasta Lake. When the Shasta and Trinity National Forests were created (in 1905 and 1907, respectively), the present era of Forest Service multiple-use management began.

Within the general area of the Forests there are several California Indian groups including the Wintu, Chimariko, Achumawi, Yana, Hoopa, and several Shastan peoples. At the time of initial contact, each group spoke a different language, while at the same time sharing certain cultural features. For instance, all were hunters-gatherers, lacking agriculture, and all practiced some form of seasonal movement.

Principal winter villages were situated adjacent to major watercourses, such as the McCloud and Trinity Rivers. Several cultural practices that were important historically affect Forest Service management concerns today. Of particular concern are places or activities associated with religious practices. As mentioned previously, a contract report prepared by Theodoratus Cultural Research deals with this issue in detail.

Interest in local Native American culture has continued unabated for over a century. The various overviews previously cited discuss the history of ethnographic research. Archaeological research began more recently, with studies of caves around Shasta Lake (i.e., Samwel and Potter Caves). Reservoir projects were the primary impetus for archaeological work between the 1940s and 1960s.

In the 1970s, several programs were established that significantly increased the scope of archaeological work within the Forests' zone of influence. Projects begun by the Forest Service and the U.S. Bureau of Land Management (BLM) included inventory, evaluation, research, and enhancement of cultural resources. These activities, started because of new legal mandates for Federal agencies, had the effect of dramatically increasing the number of known archaeological sites. Also in the 1970s, Shasta College, under the direction of Ed Clewett, conducted archaeological investigations at a number of sites in Shasta County, most notably the Squaw Creek site near Shasta Lake.

While knowledge of prehistory in this area is still limited, enough is known to suggest a broad outline of developments. It appears that the local area was initially populated some 7,000 or 8,000 years ago by people with a fairly sophisticated stone technology and a hunter-gatherer economy. Evidence of these early cultures is rather scarce, but over the next several thousand years most areas throughout the Forests appear to have been inhabited, at least seasonally. During the last 2,000 years, there is reason to believe that important changes took place in hunting and food processing technologies, in patterns of settlement, and in ethnic distributions.

During the past several years, there has been an increased use of cultural resources and associated records by outside parties. Archaeological excavations have been carried out on National Forest lands by various organizations including academic institutions and private consulting firms. This work has been sponsored by the Forest Service, as well as the California Department of Transportation (CALTRANS) and Santa Fe Pacific Timber Company. Other agencies, such as the U.S. Bureau of Reclamation, Pacific Gas and Electric Company, and various private consulting firms have sponsored inventories of National Forest lands. These types of actitivies and passage of the Archaeological Resource Protection Act of 1979 (Public Law 96-95) require increased consultation with local Native American groups to insure that their heritage concerns are adequately considered. Publication of the Uniform Regulations (36 CFR 296) for Public Law 96-95 also requires determination of which cultural resources are or are not of "archaeological interest."

Management Opportunities

Probably the most pressing and recurring problem with cultural resource management has been assessing the value of such properties. Future management strategies should include having this information available for decision makers. It is expected that actions being taken

by the State of California (Office of Historic Preservation) and the Pacific Southwest Regional Office of the Forest Service, to prepare schematic designs and update the State Historic Preservation Plan, will provide some useful guidance for assessing values. Additionally, the conscientious use and updating of the overviews mentioned above will provide a useful reference.

The management of historic sites, particularly standing structures, will require special attention. Direction for those sites should comply with the Secretary of the Interior's "Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings" (revised 1983). A recently signed Programmatic Memorandum of Agreement (State Historic Preservation Office, Forest Service, and Advisory Council of Historic Preservation) for fire lookouts and other historic properties also provides direction.

Opportunities also exist to increase the Forests' involvement with Native American tribes and spiritual leaders. Recent legislation and other actions by the Federal Government will require agencies, such as the Forest Service, to more directly involve Native Americans in their decision-making process. The Native American communities in California and elsewhere are also becoming increasingly active in seeing to it that Federal agencies protect areas of religious significance and return items that were excavated without their knowledge.

The archaeological and Native American resources of the Shasta-Trinity National Forests have long been of interest to the scientific community. In recognition of that interest the Forest signed Participating Agreements with Shasta College and California State University, Chico, in 1988, to cooperate in a long-term program of archaeological exploration. Additionally, Forest personnel have signed an agreement with Local Indian for Education, Inc., to develop projects concerning Native American history and culture.

6. FACILITIES

The Forests' facilities support a variety of management activities. Included within the context of facilities are roads, trails, bridges, major stream crossings, sewage systems, water systems, buildings, and dams.

Public Issue

One public issue relates to facilities. That issue is:

How many miles of additional roads are needed and to what standard should they be constructed and maintained in order to meet future needs? *(Public Issue #4)*

Discussion of Public Issue

Management of the Forests' road system is important to accommodate Forest users and to facilitate in the management of the resources. Most Forest use and enjoyment could not or would not occur without a transportation system.

The Forests' road system is not self-serving. Its existence and changes to it are to better serve the various uses of the Forests. As use patterns and modes of transportation change, corresponding changes may need to be made in the transportation system. A typical example is the larger recreation vehicles (RVs) in use today; they require different standards of roads within Forest Service campgrounds.

Maintenance of the Forests' transportation system is a never ending job. Maintenance relating to use is easy to understand (i.e., surface blading to eliminate ruts). Non-use maintenance may involve such things as cleaning out drainage features (culverts or ditches), painting signs, or clearing roadside brush.

Confusion still exists concerning terminology with regard to trails and roads as conveyors of vehicles. Within this document any reference to "trails" is for a single track facility used primarily for foot, horse, and in some cases, two wheeled cycles. Two track roads, jeep roads, jeep trails (common usage), and 4 X 4 trails are all considered "roads" on the Shasta-Trinity National Forests.

Current Management Situation

Transportation System - Roads. The Forests are traversed by a well-developed system of State, County, private, and Forest Service roads. The primary roads are Interstate 5 and State Highway 3 in the north-south direction, and State Highways 299, 44, and 36 in the east-west direction.

There are over 6,800 miles of inventoried system roads and an estimated 500 miles of uninventoried roads under Forest Service jurisdiction. The uninventoried roads consist of a mix of old, unobliterated logging roads, roadways created by vehicle use, and others, such as old mining roads. The uninventoried roads will be evaluated and added to the transportation system inventory if needed for future management activities. All others will be closed to use or obliterated.

About 15 percent of the Forests' inventoried road system is closed seasonally by gates, and as much as 30 percent more is closed by snow during normal winters. An additional 10-12 percent of the road system is closed following completion of management activities, such as timber harvesting. These roads are kept closed, providing there is adequate public access into the area, until future management activities necessitate re-opening.

The Forests' transportation system or Forest Development Roads (FDR) are classified as follows:

Functional Classification	FDR System (Miles)	County Systems (Miles)	Total (Miles)
Arterial	685	202	887
Collector	1,515	111	1,626
Local	4,619	72	4,691

This transportation system represents an investment of approximately $300 million. **Table III-9** provides further information. (See the Glossary [Chapter VIII] for a definition of transportation terms).

About 1,500 miles of the road system are jointly owned or cost-shared with neighboring private landowners. The exchanged easements and rights-of-use in a joint-ownership road provide that each party cooperatively maintain the facility and preserve it to standards of original construction or reconstruction. To ensure that the proper road maintenance is carried out, the Forest Service and the cooperating joint owner enter into a maintenance agreement.

Forest personnel also work closely with State and County authorities, through Memorandums of Understanding or Cooperative Agreements, concerning changes in standards or jurisdiction of transportation facilities.

Most new road construction is done as part of the contractural requirements of the timber sale contracts.

Table III-9
Inventory of Facilities by Type

Facility Type	Units	Facility Type	Units
Roads	**Miles**	Trails	**Miles**
Arterial	685	Pacific Crest Trail	154
Collector	1,515	National Recreation Trail	26
Local	4,619	Other Trails	1,139
Uninventoried (estimate)	500	**Total**	**1,319**
Total	**7,319**		
Bridges	**Number**	**Buildings ***	**Number**
Roads	84	*Residential*	
Trails	26	Permanent	90
Total	**110**	Trailers	22
Dams		**Total**	**112**
Other Government	4	*Nonresidential*	
Other Private	10	Permanent	202
Forest Service	2	Trailers	0
Total	**16**	**Total Number of Buildings**	**314**
Water Systems	**Number**	**Sewage Systems**	**Number**
Surface	6	Municipal	4
Ground	80	Septic/Leach	64
Total	**86**	Vault	60
		Lagoon	1
		Total	**129**
Administrative Sites	**26**		

* Nonrecreational buildings only

Lesser amounts of construction are done by appropriated fund public works contracts, such as campground road construction or upgrading existing roads to standards higher than are needed for timber sales. Some new road construction is done by cost share cooperators and special use permit such as within a permitted ski area or lake resort area. New road construction requires that an environmental analysis be completed and approved. New construction done by State or County jurisdictions is done under their respective environmental analyses.

The Forest Service is responsible for road maintenance work that is generated by the Forests' administrative traffic, by the use of the Forests' resources, and by persons visiting the National Forests to use and enjoy their recreation, wildlife, and scenic resources. Such maintenance will normally accommodate traffic associated with: (1) special use areas not operated as a commercial enterprise; (2) incidental non-commercial use usually related to ownership or occupancy or land served by Forest development roads; and (3) incidental use generated by commercial recreation enterprises.

Based on traffic management and use objectives, each road or road segment is assigned one of five maintenance levels. All inventoried system roads are maintained to at least maintenance Level 1. (Definitions of road maintenance levels are found in the Glossary). Projects which will reduce the watershed impacts of existing roads and contribute to a better road infrastructure have been and will continue to be identified. Needed work includes increasing the size and number of culverts, surfacing roads close to streams, installing energy dissipators, and obliterating some roads.

Management and maintenance of the Forests' transportation system emerged as a public issue because it encompasses many acres of National Forest land and creates a visible, physical impact on the land. Since Forest users traverse the road system for access, the maintenance condition and closure status of the roads are readily apparent.

The Forests' commercial users (traffic generated by commercial operations under permit, license, or contract for the use of National Forest lands and resources) and non-Forest commercial users (traffic generated by movement of commercial commodities from private lands and using forest development roads) are required to maintain the roads in a satisfactory condition commensurate with their use.

Transportation System - Trails. Trails are separate from roads but are still commonly considered part of the Forests' transportation system. Much of the unroaded portion of the Forests is traversed by about 1,319 miles of trails. These trails, less than 50 inches wide, are for use by foot, animal, or mechanized vehicles, where permitted. Any facility (road or trail) which will accommodate vehicles wider than 50 inches is considered a road (not a trail) and is referred to as such in this Draft EIS.

There are several categories or classifications of trails on the Shasta-Trinity National Forests: the Pacific Crest National Scenic Trail (PCT) (154 miles), National Recreation Trails (NRTs) - Sisson-Callahan and South Fork Trinity NRTs totalling 26 miles, and other Forest trails (1,139 miles). Additional trails may be considered for designation as NRTs in the future.

Along the route of the PCT no buffer is planned to separate trail users from management activities. This decision is specifically addressed in the standards and guidelines in the proposed Forest Plan.

The Forests' trail system is essentially complete with the exception of the Mt. Shasta area and a few isolated areas in and around developed recreation sites. New trails are planned for Mt. Shasta and Castle Crags because of their unique geologic and scenic appeal.

Trail use throughout the Forests varies from very heavy to very light. The majority of the users are backpackers, equestrian groups, hunters, and anglers. Many of the trails have been surveyed and constructed in locations which best serve user needs and which cause few adverse environmental impacts. However, many trails have deteriorated from overuse. If these trails are needed, maintenance and reconstruction work will be accomplished to perpetuate their continued use. The overall objective of the Forests' trail maintenance program is to maintain and upgrade all needed trails or portions thereof which are causing resource damage or inadequately serving the public.

Cooperative partnerships with organized groups can be used to accomplish a variety of trail maintenance needs.

Other Facilities. In addition to roads and trails, a number of other facilities under the Forests' jurisdiction must be managed and/or maintained. **Table III-9** lists these facilities.

Many of the buildings are very old and in need of major repair or replacement. A major capital investment program is needed to improve or replace these facilities. A Facility Master Plan, which will prioritize the sites and the work that needs to be done, is being updated and will be kept current. Managing the historial values of many buildings on the Forests is also very important.

Many buildings are leased from the private sector. Although leasing requires less capital investment, it significantly increases the annual cost of providing buildings.

High priority has been given to upgrading the Forests' water systems consistent with laws and regulations. Providing handicapped access and use, providing adequate storage for hazardous materials, providing adequate accommodations for mixed or both genders, where needed, eliminating asbestos risks, and monitoring for radon are some of the high priority items actively being pursued.

Management Opportunities

The number of miles of new road construction is diminishing annually. This decrease will continue as remaining unroaded areas are accessed or management decisions are made to leave them roadless. Reconstruction of existing roads will continue in order to meet the demands of increased use and new equipment. Normal deterioration will also cause a continued need for reconstruction.

Products for dust abatement and surfacing, which use less oil and oil-dependent products, need to be developed. Maintenance of the Forests' roads should continue to emphasize the prevention of resource damage. Cooperative maintenance of a jointly-owned road system will receive more emphasis as the lands served are more heavily used. Increased subdivision of private lands within the Forests' boundary will create a need for privately funded road districts.

Restrictions on trail use will be evaluated to eliminate use conflicts and resource damage and to improve the user's experience. Some changes may occur in the seven Ranger District administrative units; this may cause possible changes in some of the existing administrative sites. Increased maintenance costs could be experienced due to the age of these facilities. Cost-efficient energy retrofitting, already identified, may be needed. In the interest of annual operating cost savings, all administrative site leases will be eliminated in favor of agency-owned facilities. Public information contact sites may be exempt.

7. FIRE AND FUELS

Public Issue

One public issue emerged concerning fire and fuels:

To what extent should prescribed burning be used as a way to reduce fuel hazards, prepare sites for reforestation, and improve wildlife habitat? *(Public Issue #5)*

Air quality and particulate matter was another concern relating to prescribed fire.

Discussion of Public Issue

The primary issue relating to prescribed fire is that firewood and alternate energy resources are being destroyed. Historically, between 9,000 and 12,000 acres of timber sale slash and debris and wildlife habitat have been treated annually using prescribed fire. Emphasis has changed since 1986, however, and the number of acres being burned has been reduced. Between 6,000 and 8,000 acres are treated annually using prescribed fire, and the acreage continues to decrease as timber harvest decreases. As the population increases and town encroachments approach National Forest land, there is concern that the supply of firewood and alternative energy materials will be in short supply.

Current Management Situation

During the period of time between 1972 - 1989, 1,836 person-caused fires and 2,110 lightning-caused fires burned on the Shasta-Trinity National Forests, for a total of 3,946 fires. These fires burned an average area of 4,952 acres per year for person-caused fires, and 5,040 acres per year for lightning caused fires, for a total of 9,992 acres burned per year. Nearly 90,000 acres burned on the Forests during 1987, an extremely bad fire year.

The fire management program consists of two basic elements: (1) wildland fire protection and (2) wildland fuels management. Activities relating to fire protection are detection, prevention, presuppression, and suppression. Activities relating to fuels management are removing or rearranging them to meet protection requirements.

Prior to 1992 the Shasta-Trinity National Forests had been providing wildland fire protection for approximately 2.7 million acres. In 1992 this figure was reduced to 2.4 million acres. This decrease is the result of a balance of acreage program that was coordinated with the State of California. Prior to 1992 the Forest Service protected 724,000 acres of private or State-owned land. In 1992 this figure was reduced to 364,081 acres. Starting in 1992 the State has wildfire protection responsibilities on 200,000 acres of National Forest land within the boundaries of the Shasta-Trinity National Forests. This is an increase of about 60,000 acres over the State's previous protection responsibilities.

The size and mix of the fire organization allows Forest personnel to handle singular incidents, but places limits on their ability to respond to multiple situations or incidents. This shortfall occurs when forces and equipment are depleted because of assignments to other forests or agencies or when numerous lightning fires are burning at one time.

There is a cooperative agreement between the Shasta-Trinity National Forests and the California Department of Forestry and Fire Protection (CDF). This agreement provides for the sharing of fire protection resources, thus augmenting the fire suppression capabilities of each agency. Fires that threaten lands of more than one jurisdiction are managed jointly. Initial attack planning is based on using the closest suppression forces or resources. Training is coordinated and often conducted jointly. In addition, the Incident Command System is used by all agencies for managing fire suppression actions.

The wildland fire protection problems are dynamic and ever changing as the values-at-risk increase. Increasing values-at-risk are a result of large numbers of acres being planted with high investment timber plantations and changing environmental influences. These factors, when coupled with changing public use patterns and prolific urban interface development on intermingled or adjacent private lands, influence fire protection priorities. They also increase the dollar value loss.

Wildland fire suppression strategies and tactics have been to control all fires at the smallest size and with the least resource damage possible. These control practices have modified the environment, allowing large accumulations of natural and unused material, along with undesirable vegetation, to accumulate throughout the Forests. Within wildernesses, control strategies have produced areas of unnatural vegetation mosaics. Resource management practices have also contributed to the increased amount of fuel by not requiring adequate hazard abatement.

Fuels management activities have included the construction and maintenance of fuelbreaks and road hazard reduction to break up the contiguous fuels or vegetation. Prescribed burning of timber sale slash, by broadcast and pile burning, has been done as part of the reforestation and fuels reduction program.

The use of prescribed fire has been the most economical treatment method available for managing forest fuels.

Intensive utilization of forest residue can reduce the amount of prescribed fire necessary to meet protection and site preparation objectives for timber management.

Historically, 80 to 90 percent of the annual prescribed burning conducted on the Shasta-Trinity National Forests was done to remove logging residues and prepare brush fields for reforestation. The remainder of the burning was done to benefit wildlife and reduce fuels. With decreased acres of timber being harvested on the Forests, the percentage of logging residue created and treated would also decrease. The need to treat natural fuels occurring in the ecosystem would increase due to insect infestations, drought, and blow down due to natural causes. Methods of treatment of natural fuels include prescribed burning, as well as mechanical fuel manipulation to achieve the desired effect. The effects of smoke, resulting from prescribed fires, are considered in all prescribed burn plans to insure that State and local air quality requirements are met.

Management Opportunities

In areas of increasing value-at-risk, wildland fuels will be managed for long-range mitigation of the increasing demand for and escalating costs of fire protection.

Within wildernesses, the use of unplanned natural ignition may reduce the unnatural build up of down and dead materials. Natural barriers, vastness of continuous vegetation, topography, and weather are contributing factors.

Prescribed fires, burning under specific conditions with defined results, could be conducted using planned ignition both inside wilderness boundaries and throughout the Forests. Mosaic patterns can be achieved to meet resource constraints and concern on site specific projects. In chaparral areas, where wildlife habitat or range forage could be improved while reducing the fire hazard, this option may be employed.

Fires will always be part of the natural ecosystem, but controlling the timing and intensity of them will be necessary to minimize the impacts to human health and forest resources.

8. FISHERIES

Public Issues

One public issue focuses on fisheries:

How should watersheds be managed to maintain or enhance water quality and fisheries? *(Public Issue #6)*

Other related issues having an affect on fisheries include:

a. **There is public concern that a wide variety of ecosystems should be maintained on the Forests to specifically provide for the: maintenance and/or enhancement of habitats for Federally listed T&E species (plants and animals).** *(Public Issue #2a)*

b. **How should livestock grazing be managed to minimize degradation of riparian areas?** *(Public Issue #10)*

c. **How wide should riparian management zones (RMZs) be and what management activities should be allowed within them?** *(Public Issue #13)*

Discussion of Public Issues

Watershed Management. The Forest Service's attempt to protect and maintain fish habitat quality, using Best Management Practices (BMPs) during timber harvesting operations, is being questioned. Some of the perceived problems identified are: lack of erosion control, degradation of riparian habitats, and slope cutting on steep grades.

Specific questions raised by the public include:

1. What are the potential effects of cumulative watershed impacts on spring-run chinook and summer steelhead within the South Fork Trinity River?

2. Do Forest Service management practices adversely affect anadromous fish habitat in the South Fork Trinity River?

3. How can fish populations increase, especially anadromous fish, with an increase in clearcuts, road building and degraded watershed conditions?

4. What should be done to insure on-the-ground compliance with BMPs?

5. How should fisheries monitoring be done during timber sale harvesting?

6. What magnitude of streambank protection should be provided?

Other watershed management concerns include:

1. The Forest Service should have a clear, concise fisheries management plan; and

2. The agency needs its own fisheries protection plans; it is not enough to rely on other agency plans.

Livestock Grazing. Public concerns have to do with:

1. grazing in and near riparian areas;

2. the effect of grazing on water temperatures and fish habitat production potential;

3. grazing in wildernesses; and

4. making important redband trout stream corridors, such as Sheepheaven and Trout Creeks, off limits to grazing to prevent streambank degradation, shade loss, and eutrophication.

Streamcourse Protection. Public concerns reaffirmed that: riparian areas should be maintained to provide a sediment barrier and a shade canopy for the water and to protect stream channel integrity. RMZs should be designated for all perennial streams and for intermittent streams that are used as fish spawning and/or nursery areas.

Habitats. There is concern that habitats of sensitive fish species such as the bull trout, redband trout, rough sculpin, spring-run chinook, and summer steelhead be protected and maintained. Furthermore, can anadromous fish populations be increased by improving anadromous fish habitat capability through structural habitat improvement?

Current Management Situation

Available Resources. There are about 5,500 miles of rivers and streams on the Forests, 1,900 miles of which are fishable. In addition, there are over 50,000 acres of lakes and reservoirs.

Outstanding coldwater fisheries are found in the McCloud and Pit Rivers. Eight miles of the McCloud River (below McCloud Reservoir) are classified as a Wild Trout Stream and offer a blue-ribbon fishing experience of

National acclaim. At one time, the upper Sacramento River provided an outstanding wild trout fishery. Unfortunately, a chemical spill near the community of Dunsmuir in July, 1991 destroyed this fishery along 45 miles of its course down to the backwaters of Shasta Lake.

The headwater areas of the Trinity River (above Clair Engle [Trinity] Lake); the North and South Forks of the Trinity River and their tributaries; Squaw Creek; and Squaw Valley Creek also support fisheries of regional interest.

The fish in Shasta, Trinity, Lewiston, McCloud, and Iron Canyon Reservoirs, as well as in over 80 alpine lakes, are also of major recreational interest.

The Sacramento and Trinity River Basins once sustained several of the largest populations of important anadromous fish (salmon and steelhead) in California. Fortunes have turned against the anadromous fish runs in recent years. Typical of the situation is the winter-run chinook salmon of the Sacramento River which has been listed as a threatened species.

Factors such as dam construction, catastrophic floods, natural landslides, road construction, timber harvesting, and grazing, as well as the over harvest of fish, have contributed to reduced habitat quality and population levels. Continued drought conditions have impacted salmon and steelhead streams causing significant reductions in waterflow regimes. This has lead to a cumulative loss of spawning and rearing habitat and increased water temperatures. These factors, coupled with poor ocean survival, have accelerated the decline of anadromous fish populations in the Sacramento and Trinity Basins.

Current Use of Available Resources. Sixty million people enjoy fishing, the Nation's second most popular outdoor sport after swimming. Sport anglers generate a $28 million contribution to the nation's economy annually. Current fishing use throughout the National Forest System is estimated at 46.5 million angler days each year with a net economic value of over $1.2 billion.

Phil Pister, Desert Fishes Council, indicates that the increased rise in preservation ethics, coupled with the loss of Pacific salmon populations, have fostered a greater desire for conserving biodiversity as opposed to sustaining environmentally-taxing economic endeavors in California.

Pister reports, "Signs of this shift are already appearing in the bellwether state of California which, in 1989, sold 29 percent fewer angling licenses than in 1980, although the state's population increased by more than 7 million during the decade. In 1980 about one in 10 Californians bought a fishing license, for a total of 2.3 million. In 1989, about 1.6 million fishing licenses were sold, or one for every 20 Californians."

On the Shasta-Trinity National Forests the Recreation Resource Information System (RRIS) has provided information about the current level (FY 1988) of fish user days (FUDs) on the Forests. Warmwater fishing accounts for 267,000 FUDs (67 percent); resident coldwater fishing (streams, lakes, reservoirs) 91,000 FUDs (23 percent); and anadromous sport fishing 38,000 FUDs (10 percent).

Fish Population Concerns

General. The American Fisheries Society lists 364 North American freshwater fish as threatened, endangered or in need of special concern. This includes 139 new taxa added to the list since it was first published a decade ago. Only 26 taxa have been removed from the original list, and 10 deletions were due to extinction.

In the Trinity River Basin, Forest Service personnel are concerned about the sharply reduced populations of spring-run chinook and summer steelhead over the last five years. The summer steelhead is listed as a Forest Service sensitive fish species.

Inland coldwater streams, lakes, and reservoirs have also been impacted by the continued drought conditions. In Siskiyou County, offspring from Oregon bull trout, introduced by the Department of Fish and Game (DFG) into two private streams, have been reported as demised after once dependable year-round flowing natural springs dried-up. Reservoir levels at Shasta and Trinity Lakes are significantly below maximum pool because once abundant annual snow accumulations have not been sufficient to sustain, much less replenish, diminished water storages.

The DFG continues to supplement recreational sportfishing through hatchery releases. However, the reduced capability of the natural water environments in sustaining the wild salmon, steelhead and trout populations of the Forests is of paramount concern.

Anadromous Fish. In 1991, the American Fisheries Society identified 159 stocks of anadromous fish in the Pacific Northwest as being at moderate to high risk of extinction. Another 54 stocks were listed as being of special concern. A total of 39 stocks was listed in California. The primary reason for the decline of these stocks varies by species and locality. The continued existence of these stocks is threatened by an unquantifiable combination of hydro-electric development, over-harvest, hatchery influences on susceptibility to disease and genetic fitness and habitat conditions. High quality habitat conditions on National Forest lands are essential to conserving many of the "at-risk" stocks. Enlightened management of the anadromous fish habitat is important

to the recovery of these stocks, even though the primary reasons for the decline may not be habitat related.

Potential conflicts within aquatic/riparian zones and upslope of streamcourses include logging, road construction, recreation, grazing, and mining. Unmanaged, these activities could cause significant long-term damage to fish populations and their habitats. Simply put, fish production could become limited if a stream's ecosystem is not in harmony or balance. A prime example of a stream under stress is the South Fork Trinity River. Even though this river is gradually recovering from the catastrophic impacts of the 1964 flood event, populations of fall and spring-runs of chinook salmon, like the summer steelhead, have not responded. Their numbers remain relatively low.

Because of its geological nature, the South Fork Trinity River Basin is vulnerable to timber harvesting and road construction. Both are potential sediment producers if appropriate development constraints are not applied. Timber harvest opportunities must be sensitive to watershed and fisheries needs in order to maintain populations of fall and spring-runs of chinook salmon in this drainage.

Seven of 61 watersheds inventoried on the Forests have relatively high disturbance levels. Therefore, there is a significant risk of initiating cumulative effects within the main channels which drain into these watersheds. All seven of these watersheds are within the South Fork Trinity River basin: Butter Creek, the East Fork of the South Fork Trinity River, Gulch Watershed, Hyampom, Plummer Creek, Rattlesnake Creek, and Upper Hayfork Creek. Four of these watersheds (Butter Creek, the East Fork of the South Fork Trinity River, Plummer Creek, and Rattlesnake Creek) have the potential, if cumulative impacts do occur, to directly impact spring-run chinook and summer steelhead habitat.

Within Canyon Creek, New River, and the North Fork Trinity River spring-run chinook adults, like summer steelhead, are vulnerable to poaching during the summer since they are extremely visible in clear canyon pools. The DFG recognizes poaching as one of the most immediate threats to these fish. These latter tributaries to the mainstem Trinity River have not been identified as major sediment producers accelerated by human-induced activities, although areas of natural instability do exist within their systems.

Inland Coldwater Fish. Forest Service fisheries management efforts have concentrated very little on the wild trout populations of the Forests. Stream and high mountain lake habitat surveys have not been conducted on most inland coldwaters since the mid-1970's because of budget constraints.

The greatest concerns for the redband trout streams center on cattle grazing/disturbance, high point source recreational use, and water drafting for dust abatement.

The DFG has recommended that special management protection be developed for all redband trout waters on the Shasta-Trinity National Forests. This worthy goal is complicated by the intermingled land ownership on or adjacent to most of the redband trout streams. Implementation of special management protection measures could be compromised by private landowner investments.

Inland coldwater fisheries management has been strongly emphasized at the McCloud and Weaverville Ranger Districts. On the McCloud District, habitat typing surveys have been conducted on redband trout streams, the McCloud River and Squaw Valley Creek. At Trout Creek, a redband trout stream, the District has developed a comprehensive educational work program for students of the McCloud School District under the auspices of the Adopt-A-Watershed and Bring Back The Natives program. Other partners in this program include the DFG, PG&E, National Fish & Wildlife Foundation and Trout Unlimited.

The Weaverville District has begun development of a fisheries/watershed inventory and restoration program for Baker Gulch, Eastman Gulch, and the upper Trinity River (above Trinity Lake). Squaw Creek, on the Shasta Lake District, has been habitat typed, but no formal work agreement has been developed with the Shasta Flycasters for a habitat improvement partnership.

Inland Warmwater Fish. Shasta Lake supports a heavily fished largemouth and smallmouth bass fishery. Panfish, catfish, and bullheads provide additional sport angling opportunities. Trinity Lake supports a trophy smallmouth bass fishery and a limited largemouth bass fishery.

Shasta Lake's production of largemouth bass is below potential. Concerns exist over the largemouth and smallmouth bass populations which are especially sensitive to angling pressure and water fluctuations. The major contributing factor toward effective and successful management of Shasta Lake bass is a well-coordinated endeavor among governmental agencies, special interest groups, and local bass clubs. A working partnership composed of DFG, the Forest Service, and the Golden State Adopt-A-Lake Conservancy Program has helped to highlight the Forests' warmwater fish habitat improvement program.

Heightened efforts have been undertaken by personnel on the Weaverville District to develop a more sophisticated approach to warmwater fisheries management at Trinity Lake. A research and development program was added to the District's implementation program in 1989.

Partners include DFG, the CDF Conservation Corps, and the Trinity County Fish & Game Advisory Commission.

Habitat Improvement

General. Stream improvement for fish habitat applies to the installation of instream devices or the application of streamside procedures for correcting natural damage or problems caused by humans (USFS, 1988). More specifically, habitat rehabilitation means repair of abused or deteriorated habitat by augmenting and speeding up natural recovery. Enhancement means to create more suitable habitat than that which would occur naturally in a stream. This includes increasing access as well as directly improving or developing spawning and rearing habitat (Reeves, 1982).

The purpose of installing log structures, sometimes accompanied by the addition of boulder clusters, is to create instream structural complexity. Structural design and installation provide for improved spawning and pool rearing conditions.

Indigenous riparian plant species are planted to accelerate the growth of shading vegetation thereby reducing the harm caused by long-term solar heating. This is especially true during the summer when low flow conditions and radiant exposure can stress anadromous fish and/or trout. In addition, replanting of the riparian habitat helps anchor unstable streambanks.

The effectiveness of habitat improvement structures may not be readily apparent due to other short term influences. These influences may include annual and seasonal natural watershed variations, complications within the lifecycle of an anadromous fish species, or human-induced fisheries which may constrain the returns of fish to a stream which cannot be effectively qualified or quantified. For example, the Klamath-Trinity River basin, after four drought years, is experiencing its lowest recorded anadromous fish returns. Therefore, someone could conclude, erroneously, that installed structures are ineffective in increasing fish numbers because of the low numbers of adults or juveniles using the structures. To determine structural effectiveness considerable long-term monitoring and extensive documenting is necessary.

Anadromous Fish. The signing of the Trinity River Basin Fish and Wildlife Restoration Act (H.R. 1438 into law [Public Law 98-541]) provides a major step in needed restoration and rehabilitation addressed in the Trinity River Basin Fish and Wildlife Management Program. This program is designed to provide an increase in fishing opportunities as a result of increased populations of anadromous fish. The Model Steelhead Stream Demonstration Project Plan is another document which complements the purpose and intent of the Trinity River Basin Fish and Wildlife Management Program.

The Model Steelhead Stream Demonstration Project Plan, released in December, 1985, stipulates the need to undertake anadromous fish habitat improvement work after stream and/or watershed inventories are completed. This work is to be accomplished in a prioritized manner within tributaries of the South Fork Trinity River basin. The DFG and California Trout, Inc. were instrumental in developing this plan. Between 1986 and 1990, the Forest Service installed over 500 fish habitat improvement structures within tributaries of the South Fork Trinity River basin.

Inland Warmwater Fish. State Fish and Game Code 1743 states that, "The department (DFG) shall improve shoreline habitat for black bass in waters where insufficient habitat exists and shall encourage reservoir operating agencies to carry out shoreline habitat improvement projects." This has been the emphasis at Shasta Lake since 1982 and at Trinity Lake since 1989. DFG was an active participant in the development of the warmwater fish habitat management plan for both lakes and continues to implement project-level work. Over 1,000 manzanita brushrows have been built along Shasta Lake's shoreline to benefit black bass juveniles.

Program Planning

General. National and Regional attention has focused on the need to provide direction to the National Forests to develop and implement viable fisheries programs.

National emphasis has focused on the "Rise to the Future" program (March, 1987). The underlying principle of Rise to the Future is to emphasize fisheries management through improvement of fish habitats and to increase opportunities for the public to enjoy the fishery resource on the National Forests. The program ensures that necessary protection measures are provided during the course of other land management activities. It also identifies projects designed to restore degraded habitats, enhance existing habitats, and create new habitats. In addition, the program emphasizes accomplishments through partnerships with the states, Native American tribes, and environmental, industry and fisheries interest groups, as well as the fishing public.

The Pacific Southwest Region's (Region 5) "Rise to the Future" program reiterates integration of the fisheries program with all other resource programs. This document incorporates the state approved "Partners in Fish" program (May, 1987) which asks the Forest Service to take a strong leadership role in protecting, restoring, and improving fish habitats within the National Forests.

"Bring Back The Natives" is a new national approach by the Forest Service, the Bureau of Land Management (BLM), and the National Fish and Wildlife Foundation to restore the health of entire riverine systems and their native species on public lands. This is not a separate program of any Federal agency, but rather a series of projects that use a watershed approach to restoring stream health. The program serves as the primary instrument for implementing national strategies for riparian habitat restoration and native fish habitat conservation.

On the Shasta-Trinity National Forests three watersheds have been selected to promote the "Bring Back The Natives" program:

(1) Big Creek - Hayfork Ranger District;

(2) Trout Creek - McCloud Ranger District; and

(3) Upper Trinity River (above Trinity Lake) - Weaverville Ranger District.

Forest personnel have also assisted in the preparation of fisheries plans with other agencies, including the DFG. Each of these plans sets goals for accomplishing the long-term recovery of selected fish species or bodies of water.

Forest involvement with plans to initiate recovery of anadromous fish in the Sacramento River Basin has been limited because of the small amount of National Forest land involved (Beegum Creek).

Overall, two types of habitat problems can impose long-term impacts to the anadromous or inland coldwater fish stocks; those that are human-induced and those that are naturally inherent to a system, (i.e. unstable soils or geological formations.) Human-induced activities are further delineated into those that are under Forest Service administrative control and those outside the purview of Forest Service authority. This document will track only those Forest Service activities that have a potential to impact anadromous or inland coldwater fish habitat. An increased demand for recreational sportfishing on National Forest lands will accelerate the need to manage lake habitat for inland warmwater fish.

Selection of Fish Assemblages. Fish species have been grouped into three specific assemblages or groups to simplify tracking the effects of management activities on fish habitats within the Forests. These are:

(1) Anadromous Fish Assemblage,

(2) Inland Coldwater Fish Assemblage, and

(3) Inland Warmwater Fish Assemblage.

The species associated with each of these assemblages are listed in Appendix G.

Selection of Management Indicators. To ensure that viable populations of wild, native fish are maintained, management indicators are selected to act as "barometers" for aquatic communities. Management indicators are selected from species with similar habitat requirements. These indicators can then be used in determining the needs of a species and for predicting habitat capability responses to management activities. Simply put, these management indicators are used to guide and monitor forest management activities in a manner that will maintain biological diversity and produce enough fish to meet recreational and commercial needs.

Winter-run steelhead, spring-run chinook and summer steelhead were selected as management indicators for the anadromous fish assemblage; rainbow trout were selected for the inland coldwater fish assemblage; and largemouth bass were selected for the inland warmwater fish assemblage.

Anadromous Fish Assemblage

Management Indicators. All anadromous fish in California are in a state of severe decline. The Trinity River Basin sustains important anadromous fish populations. However, natural catastrophes and other causes have contributed to a population decline of 60-70 percent in the last few decades. Over fishing of major basin fish stocks, inundation of limited critical spawning and rearing habitats, poor water release schedules at dam sites, and terrestrial habitat alteration in sensitive watersheds are contributing factors to this decline.

Winter-Run Steelhead Trout. The winter-run steelhead was selected as a management indicator for the anadromous fish program throughout the Trinity River basin because of its presence and wide distribution throughout most of the free-flowing streams within the basin. It can be impacted by management activities, such as logging and road construction. Steelhead trout habitat readily responds to instream, riparian, and upslope terrestrial improvement and stabilization efforts.

Impetus for the protection, maintenance, and enhancement of steelhead trout habitat comes from the population declines throughout California. Concerns exist because of the low numbers of winter-run steelhead in the South Fork Trinity River Basin. Over time, natural catastrophes and human-induced activities have lead to a decline in population levels.

Forest Service personnel place great emphasis on watershed rehabilitation and fish habitat restoration for

winter-run steelhead, particularly in the South Fork Trinity River basin.

The Model Steelhead Stream Demonstration Project Plan is intended to guide the recovery of steelhead and their habitat in the South Fork Trinity River.

The wildfires of 1987 and 1988, coupled with previously identified projects, have allowed the Shasta-Trinity National Forests to apply about $900,000 to the rehabilitation of fish habitat and watersheds within the South Fork Trinity River Basin. A major contributor to this rehabilitation effort was the California Conservation Corps.

The most significant commitment to andromous fish restoration came in October, 1984 with the signing of the Trinity River Basin Fish and Wildlife Restoration Act (P.L. 98-541.) This law authorized the creation of the Trinity River Restoration Program (TRRP) with $57 million set aside for 10 years to allow for numerous restoration and rehabilitation activities on National Forest land.

Spring-Run Chinook Salmon. These chinook were once the most abundant salmon in California. Today annual runs of wild spring-run chinook are less than 1,000 fish, divided between the Sacramento and Klamath River drainages. Their numbers are declining each year (Moyle, 1991).

This species was selected as a management indicator for the anadromous fish program within the South Fork Trinity River for a number of reasons. The chinook has low reproductive numbers which appear highly sensitive to changes in biological and physical parameters; it has limited instream system distribution; and it is vulnerable to poaching. Because of the chinook's low numbers in the South Fork Trinity River, it is difficult to measure direct impacts from land management activities.

In conjunction with DFG, the Forest Service not only recognizes valuable spring-run chinook streams, but it also wants to implement management actions to prevent further destruction of their habitats. Both agencies want to play a major role in restoring damaged watersheds and streams in order to increase fish runs.

California's major spring chinook salmon runs have been lost to barrier dams. Other, much smaller runs, have been lost to other causes such as degraded habitat. Loss of the wild spring chinook runs to barriers have been partially mitigated by the Trinity River Hatchery. Self-sustaining runs of spring-run chinook are at a fraction of their historic levels. Those runs that are stable or increasing are generally those that are affected by artificial propagation (DFG, 1990).

Prior to the 1964 flood and after the demise of the San Joaquin run, the South Fork Trinity River was probably the most productive spring-run chinook stream in the State. The river was the largest single producer of spring-run chinook in the Klamath system until landslides, triggered by the 1964 storm, filled in the holding pools and buried the spawning areas. This situation improved only slightly during the next 15 years. At that time, a few of the holding areas became usable again and spring-run chinook were once again observed in isolated pools (DFG, 1990).

Since 1988, spring-run chinook adults have been counted annually within their summer holding habitat in the South Fork Trinity River. The DFG estimated that there were 11,604 spring-run chinook in the South Fork Trinity River in 1964. The Forest Service counted 59 in 1988; 6 in 1989; and 82 in 1990 between Hyampom Valley and the confluence of the East Fork of the South Fork.

Spring-run chinook are impacted as adult (or near adult) fish in ocean and in-river fisheries. The ocean commercial fishery has a major impact on the adult returns. Spring-run chinook are less impacted by the ocean fisheries than fall-run stocks because they are legal-size fish to the commercial fishery for a shorter period of time.

Native Americans are permitted to harvest returning spring-run chinook adults in the lower Klamath and Trinity Rivers using gill-nets; sport anglers use hook-and-line gear. Estimates by the U.S. Fish and Wildlife Service (USFWS) indicate that a combination of the commercial and in-river fisheries has reduced the runs of adult spring-run chinook of hatchery origin by about half (DFG, 1990).

Low flows, coupled with high water temperatures, are a primary impact to spring-run chinook within their holding areas in the South Fork Trinity River. High water temperatures can lead to high adult mortalities and low spawning success.

Spring Run (Summer) Steelhead. Two races of steelhead trout are indigenous to the Trinity River Basin: the spring-run (summer) steelhead and the winter-run steelhead.

The summer steelhead is designated as a sensitive fish species by the Forest Service because of its limited habitat preferences and low population numbers. This species was selected as a management indicator for the anadromous fish program within the South Fork Trinity River for a number of reasons. It has low reproductive numbers which appear highly sensitive to changes in biological and physical parameters; it has limited instream system distribution; and it is vulnerable to poaching. Because of the steelhead's low numbers in the South Fork Trinity River, it is difficult to measure direct impacts from land management activities.

Summer steelhead are found only in streams from the Eel River drainage to the Oregon border. The total number of summer steelhead in California varies between 1,500 and 4,000 fish. This figure is divided among 25 isolated populations. Most of these populations contain less than 100 fish, so they are unlikely to persist in the long-term unless an aggressive protection program is initiated (Moyle, 1991).

Studies indicate that summer steelhead spawn in small headwater streams with relatively low (50 cubic feet per second [cfs]) winter flows. Most of these streams are intermittent and dry up in the summer.

Summer steelhead habitat is very sensitive to disturbance. Both natural and human-caused landslides have been the major cause of habitat alteration, especially in the South Fork Trinity River. Adverse impacts to spawning sites, stream shade canopy, water temperature, bank stability, pool frequency, and volume have been documented.

The numbers of summer steelhead in Northern California were greatly reduced by the floods of 1964. These floods destroyed much of their holding habitat. Although the habitat has been improving slowly, the summer steelhead populations seem to be, at best, static (Moyle, 1991).

Since 1988, summer steelhead adults have been counted annually within their summer holding habitat in the South Fork Trinity River. DFG estimated that there were 3,500 summer steelhead in the South Fork Trinity River in 1964. The Forest Service counted 30 in 1988; 37 in 1989; and 66 in 1990 between Hyampom Valley and the confluence of the East Fork of the South Fork.

Habitat. A cursory inventory of the anadromous fish habitat on National Forest streams indicates that 296 miles are or have been used by steelhead trout and 127 miles by chinook salmon.

Historical information is unavailable to compare present-day anadromous fish habitat quality and quantity with that of the past or to project accurate trend information. A 1988 update on anadromous fish habitat capability, compiled from existing stream survey data, indicates that 33.5 percent of the habitat was rated as high quality, 44.2 percent moderate quality, and 22.3 percent (mostly the mainstem Trinity River) as low quality. None of this habitat is filled to spawner capacity.

The Forest Service's role is to protect and maintain habitat quality and quantity and, where possible, to improve habitat on National Forest lands. These are only two of the many variables influencing anadromous fish production. Working with other agencies the Forest Service is assisting in the design and implementation of anadromous fish habitat improvement projects within the Trinity River Basin.

The South Fork Trinity River is slowly recovering from the catastrophic flood event of 1964 which released millions of cubic yards of sediment into the mainstem. Summer steelhead and chinook salmon habitat were affected by this event. The South Fork Trinity River may no longer have the capability to produce the large numbers of wild spring-run chinook or summer steelhead it once did. The river is now being managed as a wild free-flowing system without any hatchery mitigation efforts. The mainstem Trinity River, on the other hand, is heavily subsidized by releases from the Trinity River hatchery.

The Trinity Alps Wilderness and Wild and Scenic River classifications on segments of New River and North Fork Trinity River are assisting in maintaining salmon and steelhead habitat in their natural pristine state.

Habitat typing is a procedure which allows the Forest Service to identify some factors limiting fish production. This process has been completed on Canyon Creek, the North Fork Trinity River, and within most of the critical spring-run chinook and summer steelhead adult holding areas in the South Fork Trinity River. The USFWS is in the process of completing its analysis of the New River. Nearly all major anadromous fish streams tributary to the South Fork Trinity River have been habitat typed within the last two years. No habitat typing is being planned for the mainstem Trinity River because of its size and complexity, and the large amount of private land involved.

Additionally, the Forest Service has conducted or coordinated an inventory of major anadromous fish watersheds within the Trinity River basin. These watersheds were inventoried to identify existing and potential problem areas.

Enhancement. The anadromous fish habitat improvement program in the South Fork Trinity River is designed to assist in the recovery of the winter-run steelhead. However, improved spawning and rearing conditions in restored nursery streams would also be of benefit to summer steelhead.

Stream habitat improvement projects for salmon and steelhead have been implemented in the mainstem Trinity River, Rush Creek, Browns Creek, and within the South Fork Trinity River and several of its tributaries.

The spectrum of habitat improvement projects for the anadromous fish population includes: watershed rehabilitation; barrier removal; installing instream structures to modify channel morphology and increase suitable fish habitat; planting riparian vegetation to increase streambank cover and canopy over a stream; and stabilizing landslide toes to reduce fine sediment delivery to stream channels.

Economics. The demand for anadromous fish, from commercial and sport fisheries, is greater than the supply.

In the 1950s, the following spawning escapement to the Trinity River Basin was estimated: chinook salmon (90,000) and steelhead (50,000). In 1983, the USFWS estimated the natural spawning escapement at 4,200 spring chinook and 19,400 steelhead.

Escapement goals for the major anadromous species in the Trinity River basin have been developed by the DFG. They are based on gains anticipated to be achieved with a management program. The production goals, as stated in terms of natural adult spawning escapement, are 6,000 spring chinook and 40,000 steelhead.

In 1984, a Forest Service evaluation, in cooperation with the DFG, identified the potential of anadromous fish spawner escapement from the Shasta-Trinity National Forests as 14,700 spring chinook and 42,300 steelhead. Attainment of Forest Service fisheries management objectives can assist DFG in meeting its production goals.

Inland Coldwater Fish Assemblage

Management Indicators. The rainbow trout was selected as a management indicator for the inland coldwater fish assemblage. It was selected because it has the greatest distribution of any of the salmonid fish species on the Forests. As such, it can be the species most directly impacted by hydroelectrical developments, logging, road construction, grazing, or mining activities.

Concern for protection, maintenance, and enhancement of rainbow trout habitat comes from land management activities centered near perennial and intermittent streams. The rainbow trout is being used to monitor activities which could cause increased sediment loading and water temperatures, reduced water quality and waterflows, blockage to spawning or rearing areas, etc. These factors could lead to the demise of important wild trout populations.

Other Species

Bull Trout. DFG reports that, "In California, the bull trout was native only to the lower McCloud River in northern Shasta and southern Siskiyou counties. This population was the southernmost within the range of the species and represented California's only native char. In the McCloud River, bull trout were limited to the area below Lower Falls ... [however]...it seems likely that major concentrations were located in the area below the present McCloud Reservoir downstream to Baird Hatchery (the latter now inundated by Shasta Lake)."

As authorized under the California Endangered Species Act, Section 2050 to 2055, the State of California Fish and Game Commission has listed the bull trout (Salvelinus confluentus) as an "endangered" species.

The bull trout was designated as an endangered species by the State of California because by the mid 1970's its numbers had declined drastically to the point where none had been reported since 1968. Two bull trout, captured in 1975, gave hope that the species could effect a recovery. However, extensive investigations conducted by the DFG between 1976 and 1987 were unsuccessful in capturing any additional bull trout. As such, it appears the bull trout is extirpated from the McCloud River system (Rode, 1988).

There is no precise reason for the demise of the bull trout, but speculation suggests that several cumulative effects, acting in concert, were responsible. Factors leading to the bull trout's decline include: inundation of habitat by Shasta Lake backwaters; potential competitors, such as squawfish; elimination of the runs of chinook salmon, which may have deprived the bull trout of enough protein to maintain the population; and the blocking of upstream spawning migrations. In addition, the introduction of ecologically similar brown trout may have contributed to the decline (Moyle, 1976).

The DFG has recently introduced a non-native bull trout from Oregon into the McCloud River Basin. However, it will take time and a greater distribution before the bull trout can be used as a management indicator of Forest Service activities. Since the Oregon bull trout is a newly introduced species on private lands, population monitoring is at the discretion of DFG.

Redband Trout. Redband trout constitutes a subspecies of rainbow trout native to western North America. Originally native to much of the Pacific Northwest, redband trout distribution has shown a dramatic reduction due to crossbreeding and competition with non-native trout. Redband trout now appear as small, isolated, relict populations in a few stream drainages.

The redband trout exists on and adjacent to the Shasta-Trinity National Forests in the mainstem McCloud River above the Upper Falls, and in Edson Creek, Moosehead Creek, Sheepheaven Creek, Swamp Creek, Tate Creek, and Trout Creek (Bacon, 1980).

The redband trout is recognized as an "emphasis" fish species by the Shasta-Trinity National Forests. An "emphasis" species is one of high public interest and demand. The management goal for an "emphasis" species is to maintain or improve habitat capability where economically and biologically feasible.

The greatest concerns for redband trout streams center on cattle grazing/disturbance, high point source recreational use, and water drafting for dust abatement.

A Comprehensive Habitat Management Plan was developed for redband trout cooperatively between the Forest Service and DFG (Bacon, 1980). Management priorities were established for each of the above-mentioned tributary streams to the McCloud River. In the action plan, top priority was placed on acquiring private land at Trout Creek, especially land adjacent to the redband trout's essential habitat.

The redband trout was not selected as a management indicator because of its low reproductive numbers, its limited instream system distribution, and the large contingency of private ownership adjacent to known redband trout streams.

Rough Sculpin. As authorized under the California Endangered Species Act, Section 2050 to 2055, the State of California Fish and Game Commission has listed the rough sculpin (Cottus asperrimus) as a "threatened" species.

The rough sculpin is biologically rare due to its extremely limited distribution and low population density within its range. It is potentially threatened by habitat degradation in the form of increased shoreline development, changes in land and water use, and the introduction of exotic organisms. A major potential threat is the introduction of non-native fishes which could either compete with or prey on this native species. The low abundance of rough sculpin within some habitats is another source of concern since extirpation from a portion of its range would require a long time for recovery (Ellis, 1988).

Fisheries investigations by BioSystems Analysis, Inc., located rough sculpin in aquatic habitats on private lands and Lassen National Forest administered lands in 1983 and 1984 in the Pit River system. These investigations indicated the presence of Pit and marbled sculpin, but not the rough sculpin. No habitat enhancement or species management plan is being developed for the rough sculpin.

Other Trout. Trout species are widely distributed throughout the Shasta-Trinity National Forests. Trout waters include low to high gradient streams, low to moderate level reservoirs, and high alpine lakes. Self-perpetuating wild trout populations are found within many of these bodies of water. Existing and suitable trout waters, containing brook and brown trout populations, are maintained and/or supplemented as necessary (i.e. high alpine lakes) at the discretion of DFG.

Until 1990, little effort had been devoted toward inland coldwater fish in the way of new high tech surveys, studies, research, habitat improvement, or monitoring. A more indepth analysis of the inland trout waters began at that time. However, this effort remains constrained because budgetary monies are predominantly allocated to the anadromous fisheries program in Region 5.

The inland coldwater fishery is characterized by three major gamefish trout species (rainbow, eastern brook, and brown). Kokanee salmon are present in Clair Engle (Trinity) Lake, but they have not been significant contributors to the angler's creel in recent years.

Native (or wild) and hatchery trout populations can be found in many streams within the Forests. Hatchery trout are planted to supplement the wild populations in heavily fished waters. Shasta and Trinity Lakes, in particular, receive considerable angler pressure.

Outstanding coldwater fisheries are found in the Sacramento, McCloud, and Pit Rivers. Eight miles of the McCloud River (below McCloud Reservoir) are classified as a Wild Trout Stream and offer a blue-ribbon fishing experience of National acclaim.

The headwater areas of the Trinity River (above Trinity Lake), the North and South Forks of the Trinity River and their tributaries, Squaw Creek, and Squaw Valley Creek also support fisheries of regional interest.

Habitat. Within the Shasta-Trinity National Forests there is rainbow trout habitat in 1,900 miles of fishing streams; 38,159 acres of lakes and reservoirs; and in numerous recreational important alpine lakes.

Historical information is unavailable to compare present-day inland fish habitat quality and quantity with that of the past or to project accurate trend information. A 1988 update on inland fish habitat capability, compiled from stream survey data, indicates that 7.9 percent of the habitat was rated as high quality, 63.7 percent moderate quality, and 28.4 percent as low quality.

It is illogical to conclude that all streams were once of high quality and that over time they have been degraded to their current levels of production strictly as a result of human-induced impacts. It is difficult to judge whether inland coldwater fish habitat is stable or improving. In certain drainages, geological processes limit fish productivity. Unfortunately, these natural processes may have been accelerated or aggravated by people's presence in the drainage. Impacts to inland fish habitat have occurred in streams on National Forest lands in the past, but increased public concern and more restrictive protective measures have decreased these impacts in recent years.

On National Forest lands, the long-term trend favors maintaining good quality inland coldwater fish habitat through reduced road construction and timber

harvesting activities. Management practices are not intended to compromise inland coldwater fish levels but rather to maintain and improve them where necessary and feasible.

Undoubtedly, the best protection for wild trout populations exists in waters located within wild and scenic rivers, wildernesses, and spotted owl habitat conservation areas (HCAs). No major land disturbing activities, except for wildfire suppression, would intrude upon the pristine conditions within a wilderness. Similarly, most major land disturbing activities would be minimized, but not completely eliminated within the HCAs and wild and scenic rivers. With respect to the inland coldwater fish program, particularly rainbow trout in streams, the protection and maintenance of fish habitat has received greater emphasis than habitat improvement.

The Forest Service is working coperatively with the DFG to achieve its general fisheries management objectives of the Wild Trout Program. These objectives are to:

1. maintain wild trout populations at levels necessary to provide satisfactory recreational angling opportunities;

2. maintain and enhance, where possible, the habitat required for optimum wild trout production; and

3. preserve the natural character of the streamside environment.

Enhancement. Rainbow trout habitat, like that of the steelhead trout, can respond readily to instream, riparian, and upslope terrestrial improvement and stabilization efforts.

The spectrum of habitat improvement opportunities for inland coldwater fish includes: installing instream structures to modify channel morphology and increase suitable fish habitat; fencing streamside areas and planting riparian vegetation to increase streambank cover and canopy over the stream; and stabilizing landslide toes to reduce fine sediment delivery to stream channels.

The most recent notable efforts for inland coldwater fish habitat improvement were undertaken on the Mt. Shasta Ranger District to improve inlet spawning streams at high alpine lakes. On the McCloud Ranger District efforts have been made to maintain and/or improve redband trout habitat at Trout Creek.

In July, 1986, the Forest Service conducted a stream habitat condition survey in Trout Creek and recommended riparian and instream protection measures to enhance the redband trout population.

In July, 1987 fisheries surveyors observed 267 redband trout in Trout Creek and judged the redband trout habitat for older age fish to be a limiting factor on the stream. The surveyors recommended the implementation of a fish habitat improvement program.

In May, 1988, McCloud Ranger District personnel prepared a Trout Creek Management Plan for public recreation opportunities and fish rehabilitation projects. This plan allows for the following actions: (1) dispersed public camping outside of a 50-foot riparian management zone with a 14-day stay limit; (2) closes roads causing damage to the riparian habitat; (3) controls livestock grazing; (4) prohibits off-highway vehicle use within meadows and riparian areas; (5) permits water drafting in designated areas only; and (6) calls for the implementation of fish habitat restoration projects to protect the redband trout.

In July, 1988, and again in September, 1988, Forest Service personnel completed fish habitat improvement projects in upper Trout Creek. In October 1988, fisheries personnel surveyed Edson, Moosehead, and Trout Creeks for potential habitat improvement and rehabilitation opportunities. They identified a total of 48 fish habitat improvement projects on these streams. In 1989, 40 acres within Trout Creek meadows were fenced off for added protection from random cattle grazing.

Economics. As recreational sportfishing increases in California, high quality stream and lake fishing for trout will be in greater demand. Wild trout populations cannot withstand a high degree of angling pressure. For inland coldwater fish, where access has been developed, the demand for high quality stream and lake fishing exceeds the supply. Where access is restricted, the supply may exceed the demand. In selected areas (i.e. reservoirs, where angler demand exceeds the natural supply) hatchery reared rainbow trout are stocked at the discretion of DFG.

However, current hatchery production will not be able to sustain the consumptive angler needs of the next century. DFG personnel predict that State hatcheries, which now produce 6 million pounds of fish annually, will need to supply 9 million pounds of fish annually by the year 2000 and 13.5 million pounds annually by the year 2020 to meet sportfishing demands. As such, wild trout management on National Forest lands needs to be innovative, regulated, and monitored to ensure a high quality recreational sportfishing experience.

Inland Warmwater Fish Assemblage

Management Indicators and Other Species. The largemouth bass was selected as a management indicator for the inland warmwater fish assemblage. This will help to evaluate the success of increasing warmwater fish in

lakes and reservoirs through a shoreline habitat improvement program. Other species that can benefit from this effort include smallmouth bass, bluegill, crappie, and catfish.

Habitat. Habitat capability for warmwater fish in lakes and reservoirs on the Shasta-Trinity National Forests totals 11,518 acres.

Since 1984, DFG personnel have maintained mazanita brushrows at Shasta Lake with the assistance of California Conservation Corps (CCC) crews. Two new, large work forces have provided additional depth to the warmwater fish habitat program: the Sugar Pine Conservation Camp at Shasta Lake and the Trinity River Conservation Camp at Trinity Lake.

In 1989 and 1990 the Trinity Lake shoreline was habitat typed as outlined in the "Trinity Reservoir Fisheries Habitat Management Plan" [Phase I/Task 2]. The implementation of habitat improvement projects at Trinity Lake began in 1990. Using the same methodology, habitat typing was done on Shasta Lake in 1991. Habitat typing was undertaken as a prelude to selecting shoreline sites for appropriate treatment (habitat improvement).

The Shasta-Trinity National Forests, in cooperation with the DFG, have produced two Warmwater Fish Habitat Management Plans aimed at increasing the largemouth bass production at Shasta and Trinity Lakes.

No long-term monitoring and analysis plans have been developed for Shasta Lake. In 1990 DFG personnel began population monitoring at Trinity Lake to estimate relative abundance of target fish species between treated (habitat improved) and untreated (control coves).

The warmwater fish habitat improvement program at Shasta Lake has involved constructing manzanita brushrows and artificial cover reefs, hydroseeding barley and rye grasses along the shoreline, planting button bush and willow shoots, and limiting oak tree felling. The habitat improvement work at Trinity Lake has included the development of brush cover, log cribs, and the planting of willows.

Economics. For inland warmwater fish the demand for large and smallmouth bass exceeds the supply. Substantial habitat modifications are necessary to increase yields so supply can be in balance with demands. Other warmwater species are available in greater quantity than present demand.

Management Opportunities

General. Two conservation strategies have emerged as critically essential to the management of salmon and trout resources on National Forest lands. These strategies are to conserve whole river systems (holistic watershed management) as well as to protect the most precious segments of these river systems. Both strategies are essential to achieve the general goals of conserving biodiversity and implementing the precepts of the Wild Trout Program. Scientists and the Oregon Rivers Council have developed a watershed strategy for meeting these needs. They appear in the following order:

- protect what remains of the intact headwaters areas;
- protect and ultimately restore the riparian zones along every river and stream;
- protect and restore flow regimes that will sustain the life of rivers over the long-term.

A Five-Year Fisheries and Watershed Strategy Management Plan, consistent with the land management planning process, should take into account the following recommendations:

Anadromous Fish Assemblage

- Rebuild the spring-run chinook and summer steelhead populations to levels where special protection is no longer needed.
- Further protection could be afforded to summer steelhead populations in Canyon Creek and the North Fork Trinity River by designating these streams as Wild and Scenic Rivers.
- Intensify law enforcement efforts, in cooperation with DFG, to assist in curtailing poaching activities on spring-run chinook within the South Fork Trinity River.
- In cooperation with DFG, identify summer steelhead streams that are tributary to the mainstem South Fork Trinity River.
- Work cooperatively with DFG and the Trinity River Restoration Program to attain production goals for spring-run chinook and summer steelhead in the South Fork Trinity River. This can be done by identifying and evaluating opportunities for Interim Artificial Propagation (IAP) within the South Fork Trinity River.
- Catalogue structural improvements by stream reach and institute an annual instream structure maintenance program.

Inland Coldwater Fish Assemblage

- Develop a lake and stream atlas, with DFG, distinguishing major wild trout waters from hatchery-planted trout waters.

- Conduct frequent interagency recreation/fisheries discussions to outline a pattern for growth and development to meet future demands.

- Catalogue potential public access areas that can be developed to help meet future recreational sportfishing demands.

- Cooperative opportunities need to be identified and developed with the DFG to improve trout populations in lakes, reservoirs, and streams. Improvement for inland trout in streams would focus predominantly on the Upper Trinity River watershed followed by those in the Upper Sacramento River. Opportunities for increased inland trout production, other than the addition of structures, in lakes and reservoirs should be investigated at Shasta Lake, Lewiston Lake, Trinity Lake, and Iron Canyon Reservoir.

- Evaluate dams at the outlets of high alpine lakes (outside of wildernesses) to determine their condition and the need to replace or modify them. Many of these dams are flow maintenance dams which release water during periods of low streamflow. Each may be important in maintaining a wild trout population below the lake.

- Future habitat improvement opportunities in the major lakes include: planting or protecting riparian vegetation to minimize sedimentation; improving access for management; and regulating water levels or dredging to increase suitability.

In cooperation with DFG, designate three watersheds with viable trout populations for long-term fish population and watershed condition monitoring.

Personnel from the Shasta-Trinity National Forests are in the process of developing a fisheries/watershed partnership program, with the McCloud School District, for Trout Creek under the auspices of the Adopt-A-Watershed program. This program will provide the opportunity for annual monitoring and restoration activities to stimulate the recovery and promote the health of redband trout and their habitat in Trout Creek.

Acquire specific parcels of private land that contain redband trout populations, especially adjacent to Sheepheaven Creek.

Inland Warmwater Fish Assemblage

In conjunction with DFG and other appropriate agencies, evaluate opportunities to increase fish populations through nutrient enrichment, development of sub-impoundments, intensifying pen culture, and manipulating lake drawdown levels.

Develop additional sportfishing access areas at Shasta and Trinity Lakes for use by the full spectrum of recreational anglers.

9. FOREST PESTS

Public Issue

No public issue specifically mentions forest pests. However, a related issue addresses the use of herbicides. That issue is:

Should herbicides be used to control vegetation in order to meet timber management objectives? *(Public Issue #15)*

Vegetation can be considered a forest pest if it prevents the Forest Service's goals or objectives from being attained. The issue of herbicide use to control vegetation is discussed in the Timber Section.

Current Management Situation

Forest organisms sometimes interfere with the attainment of the Forests' goals and objectives. When these organisms affect planned objectives, they are referred to as forest pests. A certain vegetation type may be a pest in one area or situation but may not be a pest where different objectives are being pursued. Native organisms that function as pests are established elements of the forest and range ecosystem, and they co-evolve with their habitat. These forest pests affect the natural ecological processes and are affected by the same processes themselves. Non-native organisms can cause substantial changes in ecosystems because native vegetation may have little resistance, and natural biological controls are usually lacking.

Pests can affect forest resources in a variety of ways. The loss of timber through mortality and growth loss is obvious. Pests can also adversely affect wildlife by altering the habitat required for certain groups of organisms. Dead trees on a hillside may alter the visual landscape. The loss of tree cover and creation of openings in the forest canopy in developed recreation areas can interfere with recreation objectives. The actual effect of pest organisms on the Forests' resources is dependent on the management objectives for an area.

Populations of some organisms increase to levels at which they are considered pests only on rare occasions. For other organisms, the sequence of events leading to their population increase is so unusual that it is difficult to anticipate in advance. These events are dealt with on a case-by-case basis using the principles of integrated pest management. An example of a unique population increase was the western budworm infestation in the vicinity of Trinity Lake. This infestation began in 1981 and lasted about six years; it eventually covered over 100,000 acres of timber land in mixed ownership. Moderate growth losses and some mortality in smaller trees took place in the Douglas-fir host species. Control of this infestation was initiated in May, 1985 by aerial spraying Bacillus thuringiensis on about 90,000 acres, about half of which were on National Forest lands.

Certain organisms grow in portions of the Forests at levels which are likely to interfere with some management objectives. Preventive measures for these situations can be included in management prescriptions. Several non-native organisms have a high potential to disrupt management activities if they become established. Established methods to exclude these organisms can be incorporated into plans for activities, or areas, which pose a high risk of introduction.

Dwarf mistletoes, Arceuthobium spp., are a group of parasitic plants that attack most of the conifer species on the Forests. Individual species are usually specific to a certain host. They are widespread in distribution. They reduce the vigor of their host which results in reduced growth and increased risk of mortality. Because of the way they spread, mistletoes can become particularly damaging in stands that are comprised of predominantly one tree species and where both overstory and understory are present. They can easily be managed silviculturally; however, it is most advantageous to avoid their establishment or the situations where they can increase.

White pine blister rust, caused by Cronartium ribicola, is a disease of sugar pine and other five-needled pines. It can kill small trees before they reach commercial size or reproduce. Blister rust can also result in the top-kill of larger trees and increase their susceptibility to successful bark beetle attack. Genetic resistance to this disease has been identified and an active program is ongoing on the Forests to screen and locate resistant individuals. As of 1992, there were two resistant sugar pines identified on the Forests. Once resistance is identified, seed can be collected and propagated during regeneration efforts. Other more specialized treatments, such as pruning, may also be used in certain situations.

Black stain root disease, caused by Leptographium wageneri, is common in ponderosa pine stands on the McCloud Flats. The disease primarily attacks trees at least 40 years old. Silvicultural systems, which reduce the proportion of ponderosa pine in a stand and favor other tree species, have shown some promise in reducing the local impact of the disease.

Annosum root disease is widespread in the eastside pine stands on the Forests. All species of conifers are susceptible to the disease, but white and red fir are especially prone to substantial root decay. Disease centers are initiated when a spore of the fungus Heterobasidion annosum infects the stump of a freshly cut pine. Once established, the fungus grows through root systems and

mortality centers develop. Centers may persist for decades and eventually occupy up to one tenth acre or more. Initiation of disease centers can be prevented by treating pine stumps when trees are cut. Annosum root disease also causes concern in developed recreation areas because of tree mortality and hazard to recreationists from the failure of root-decayed trees. Treating conifer stumps can prevent infection in recreation areas.

High stocking levels are a contributing factor to conifer mortality. When the stress from heavy stocking and competing vegetation is combined with an additional stress such as the drought of 1975-77, or the dry period from 1989-91, the amount of annual mortality can increase several times. In areas where it is consistent with other management objectives, thinning or releasing stands can reduce mortality.

Pines are a significant component of the mixed conifer and eastside pine types and are important in other areas of the Forests as well. Pine slash created during management activities can be used by pine engravers, Ips spp. for breeding. This can result in some mortality or top-killing of residual trees. In areas where the loss of residual trees would conflict with management objectives, the timing of activities and subsequent treatment of slash can reduce the probability of mortality.

The gypsy moth is a non-native insect which has not been permanently established in California. It has been eradicated several times from California, and there have been infestations in Oregon, Idaho and Utah. The primary means of spread is by egg masses or pupae transported on outdoor furniture or recreational vehicles. Feeding by the gypsy moth causes defoliation, and in some cases mortality, of a wide variety of host trees and shrubs. Most resources would be impacted by an infestation. Early detection by pheromone trapping makes it possible to attempt eradication when the infestation is still small enough for treatment to be effective.

Port-Orford-cedar root disease, caused by Phytophthora lateralis, is a non-native disease first observed in natural stands of Port-Orford-cedar in southwestern Oregon during the 1950s. The disease is present in the Smith River drainage on the Six Rivers National Forest. There is no evidence that the fungus, which is soil-borne and spread by water or soil movement, has spread to the Shasta-Trinity National Forests. Port-Orford-cedar trees of all sizes and ages are susceptible to the disease. Management strategies focus on preventing introduction of the fungus into uninfested areas. The Port-Orford-cedar Action Plan, approved in June 1988 by the Regional Forester, will continue to be followed.

Pocket gophers, Thomomys spp., can adversely affect regeneration efforts on many parts of the Forests. They are most common in the eastside pine type on the McCloud District and in the higher elevation white and red fir types. A variety of measures have been taken to reduce their population, including habitat manipulation, trapping, and poisoning.

Management Opportunities

The Forest Service has been directed to implement an integrated pest management (IPM) approach when dealing with forest pests. IPM is a process that integrates pest information with resource management considerations to achieve goals and objectives as part of the NEPA decision-making requirements. This process has been broken down into a series of steps: (1) prevention, (2) detection, (3) evaluation, (4) suppression, and (5) monitoring. Coordination with other agencies, such as the California Department of Forestry and Fire Protection (CDF), is part of an IPM effort in some situations.

Prevention is a major element of IPM. This involves avoiding the impact of pests before they occur. Prevention includes regulatory measures, cultural measures, and the use of genetically resistant stock.

Detection, or the early discovery of potential pests, is critical to successfully preventing damage. The adverse effects of many pest organisms can be reduced quickly and easily if detected in their incipient stages. Also, more options are often available for reducing their damage when discoveries are made early.

The evaluation process involves the gathering and interpretation of information about the pest situation in order to develop possible alternatives to meet management goals and objectives. This includes biological, environmental, and economic information.

Suppression activities are directed at reducing pest-related damage to acceptable levels. The techniques to achieve this can include, either singly or in combination, silvicultural, mechanical, chemical, and biological methods. A full range of methods, as well as "no action", is considered for each situation. The preferred course of action is selected on the basis of the ability to attain management objectives, biological effectiveness, cost efficiency, and human health and environmental safety. The activities and techniques used are determined during the decision-making process and are tailored to the specific situation, including pest, host, and management objectives.

Monitoring has two phases in IPM. First is the need to determine if any suppression activity met the intended objective. In the broader context, monitoring also needs to be done to determine if the IPM process is adequate and if management goals and objectives are being met regardless of what activity, if any, was undertaken.

Forest pest management goals should be directed toward reducing pest-related losses to levels commensurate with management goals and objectives. Climatic conditions favorable to pest outbreaks will likely occur in the future. However, the magnitude of the losses due to these outbreaks will depend, in part, on the effectiveness of mitigating actions to maintain tree vigor and health so that these destructive impacts are reduced.

10. GEOLOGY

Public Issue

No public issue was raised which specifically focuses on geology.

Current Management Situation

Personnel on the Shasta-Trinity National Forests have nearly completed a third-order Geologic Resource Inventory (GRI) which contains maps at a scale of 1:24,000. These maps detail the seismic hazards, volcanic hazards, avalanche hazards, groundwater resources, geomorphic features, and bedrock geology elements on the Forests. Current emphasis is on performing second-order geologic inventories while participating in Ecological Unit Inventories.

No slope stability hazard element has been completed for the entire Forests; however, a general one was completed for areas which have the greatest slope stability hazards. This inventory was incorporated into the Planning Data Base for Land Management Planning. Documentation of the GRI is in progress. In addition, the U.S. Geological Survey (USGS) has compiled an inventory of Known Geothermal Resource Areas (KGRAs).

The Shasta-Trinity National Forests cover a broad expanse of land with a widely diverse and complicated geology. The majority of the Trinity Forest is underlain by a portion of the Klamath Mountain physiographic province. This province has been divided into four belts which are separated by northwest trending faults. The Trinity Forest covers portions of the eastern, central, and both western belts. The west and southwestern portions of the Shasta National Forest are underlain by the eastern belt of the Klamath Mountains province.

Rocks of the Klamath Mountains province range in age from the Ordovician Period through the Jurassic Period, or 500 million years to 135 million years ago. Rock types within this province include sedimentary and volcanic, both of which are highly metamorphosed locally. Intrusive rocks range from ultra-mafic to granitic.

The western and southwestern side of the Trinity Forest is underlain by the Franciscan Complex of the Coast Ranges which is Cretaceous in age (65 to 135 million years ago) and is generally composed of metasedimentary rocks. The southeastern edge of the Trinity Forest is underlain by the Great Valley Sequence which is a thick sequence of sedimentary rocks of Late Jurassic to Cretaceous age (145 to 65 million years ago). See **Figure III-3.**

The northeast portion of the Shasta National Forest is underlaid by volcanic rocks of the Cascade Range and Modoc Plateau. These volcanic rocks are generally younger than 4 million years old. The Medicine Lake volcano and Mt. Shasta are located within the northeastern portion of the Shasta National Forest. Both volcanoes are considered active.

Geologic Hazards

Four types of geologic hazards exist on the Forests: volcanic, seismic, snow avalanche, and slope stability. The identification of geologically hazardous areas is important so that appropriate management direction can be formulated for land use in these areas.

Volcanic Hazards

Volcanic hazards are quite widespread on the Shasta National Forest. Three major active areas have been identified; however, many additional recent cinder cones and lava flows are dispersed about the Forest. Mt. Shasta and the Medicine Lake Highlands lie in the north central and northeastern portions, respectively, of the Shasta National Forest. Mt. Lassen, the third major volcanic center, lies 50 miles south of the Forest.

a. Mt. Shasta is a stratovolcano which was formed within the last 100,000 years during four cone building periods. Extensive lava flows and pyroclastic flows originated predominantly at the central vents. The lower flanks of the volcano consist mostly of a broad apron of coalescent fans of pyroclastic, mudflow, ash, and fluvial deposits. It is believed to have last erupted in 1786.

   The volcanic hazards of Mt. Shasta have been well documented (C. Dan Miller, 1980) with areas subject to volcanic hazards zoned according to hazard level. Three types of hazards were recognized: (1) lava flows, (2) pyroclastic flows and mudflows, and (3) air fall tephra. In addition, recent studies have identified a large deposit of volcanic rocks which extend 30 miles north of the summit. These were deposited by a large lateral blast or landslide from an ancestoral volcano. The communities of Mt. Shasta, Weed, and McCloud all lie directly on the flanks of the volcano and are likely to be affected infrequently by lava flows. However, all of these communities lie within an area likely to be affected by pyroclastic flows and mudflows. Historically, wind currents tend to be from the southwest, so that in the event of a tephra eruption, ash would likely be carried northeastward, away from local population centers.

b. The Medicine Lake Highlands is a broad shield volcano which has a large caldera at its summit and over

Geologic Province boundaries are only approximate at this scale.

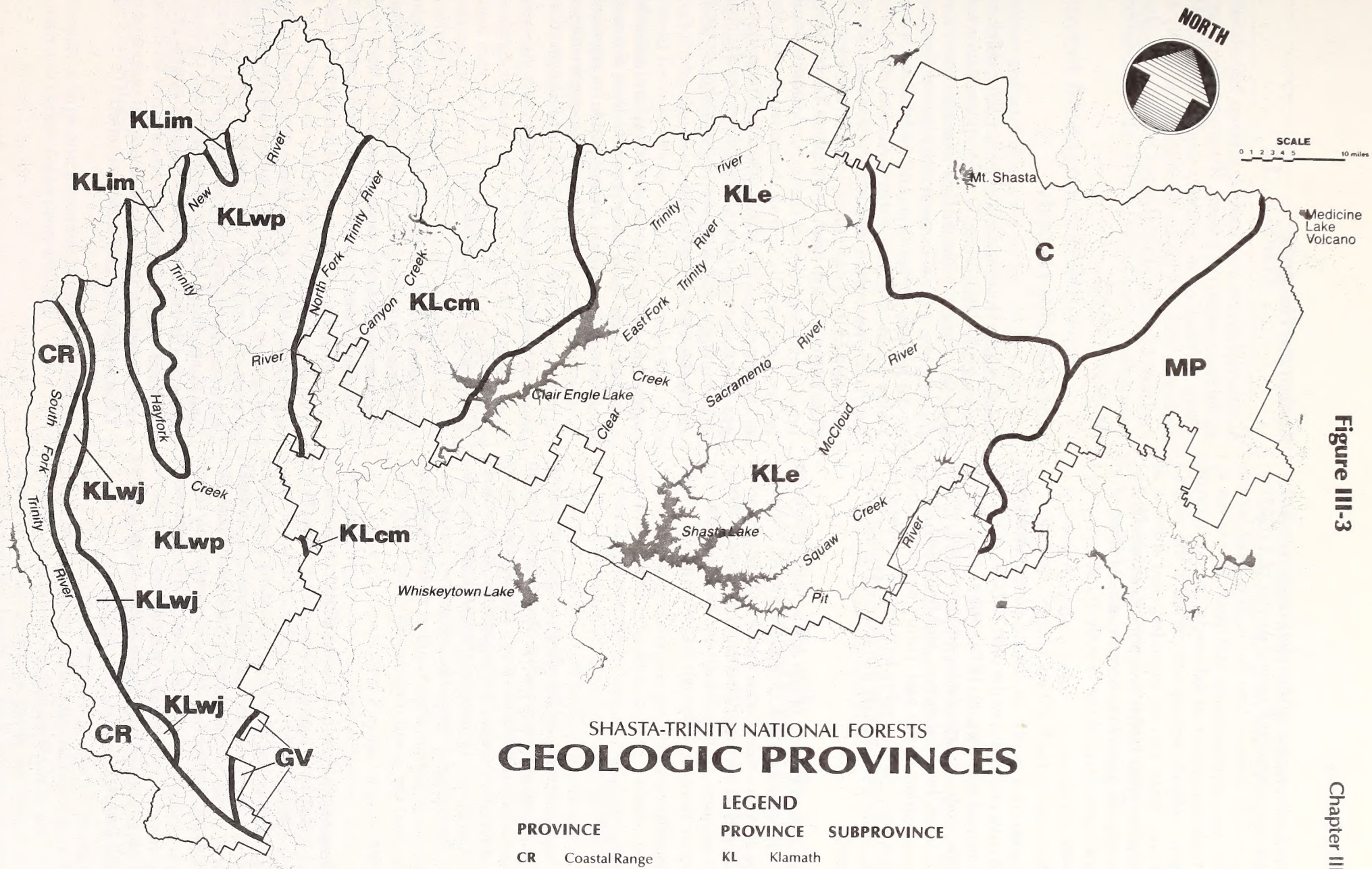


Figure III-3

SHASTA-TRINITY NATIONAL FORESTS

GEOLOGIC PROVINCES

LEGEND

PROVINCE		PROVINCE	SUBPROVINCE
CR	Coastal Range	KL	Klamath
GV	Great Valley	wj	Western Jurassic
C	Cascade	wp	Western Paleozoic
MP	Modoc Plateau	cm	Central Metamorphic
		e	Eastern Belt
		im	Ironside Mountain

100 smaller lava cones and cinder cones on its flanks. The volcano developed over a period of 1,000,000 years, mainly through lava flows. The most recent activity was approximately 500 years ago when a large tephra eruption was followed by an extrusion of obsidian. Volcanic activity will persist in the future. Local lava flows can be expected, and there is a potential for great tephra eruptions. Fortunately, the Highlands are somewhat remote, so activities of a volcanic nature would not directly impact any communities.

c. Mt. Lassen is a cluster of dacitic domes and vents which have evolved over the past 250,000 years. The most recent eruption, in 1914, began as a tephra eruption, with steam blasts, and climaxed with a lateral blast, hot avalanches, and mudflows. Some ash was carried to the east. Future eruptions could result in wind-carried tephra to the north, toward the Forest, but it is more likely that it would be carried to the east.

These three main centers of volcanic activity have been shown to be recently active. Of equal concern, however, are all the smaller cinder cones that dot the landscape in the north and eastern portions of the Shasta National Forest. These are considered dormant. However, if re-activated, their hazards, although less widespread, could be devastating.

Seismic Hazards

Seismic hazards consist of the effects of ground shaking and surface rupture along and around the trace of an active fault. Seismic hazard areas appear to be very limited within the Forests. Earthquakes of Richter magnitude 4.5 and 3.7 occurred in 1978 and 1981, respectively, in the Stephens Pass area in the northern portion of the McCloud District. Both resulted in surface rupture along the fault trace and moderate shaking in the town of Tennant.

Minor tremors have been recorded all across the Shasta National Forest, and many surface traces of faults are evident, especially in the northeastern portion. Some of these faults are believed to be active. Many areas of the Trinity Forest are prone to seismically-induced landsliding due to rapid ground acceleration from local and coastal seismic activity. Surface traces of relatively recent faulting are minor on the Trinity Forest, with most seismic shaking induced by relatively deep seismic events. No Alquist-Priolo Special Fault Study Zones are recognized within the Forests.

Avalanche Hazards

Avalanche hazards are extensive in steep, high elevation, alpine areas within the Forests. These areas are generally above treeline or in sparsely vegetated areas. Key avalanche areas on the Forests include the Trinity Alps, the Trinity Divide, and Mt. Shasta. Other than Mt. Shasta, these areas are not highly used by winter recreationists due to poor access.

Slope Stability Hazards

Slope stability hazards consist of active landslides and dormant landslides which have the potential for activation. Slope stability hazards are found on every Ranger District but are more common within the western portion of the Klamath Mountains and Coast Ranges on the Trinity Forest. Major unstable areas include the South Fork Trinity watershed, the steep canyon lands along the main fork of the Trinity River, lands on the west side of Clair Engle (Trinity) Lake and canyon lands along the upper Sacramento and Pit Rivers. In addition, valley inner gorges, which are those over steepened slopes adjacent to streamcourses, are highly unstable. These inner gorges, formed through mass wasting in response to channel downcutting and streambank undercutting, occur commonly throughout the Forests.

Valley inner gorges, active landslides, and other highly unstable lands have been removed from the suitable timber base. These areas are unsuitable for regeneration timber harvest activities. This is because management activities contribute to the risk of landslide activation and resultant water quality degradation.

Groundwater Resources

Groundwater resources are relatively plentiful on the Forests although the geologic systems which control their occurrences, quantity, and quality are quite varied and not well defined. Economics or land ownership often interfere with the development of the resource, especially in areas of isolated National Forest lands or steep topography. Based on numerous groundwater siting investigations, no regional aquifers are present in the Forests. Groundwater infiltrates through local bedrock fracture systems and concentrates along large fractures and faults. These fracture aquifers extend up to several miles across the landscape but do not appear to link to "regional" aquifer systems. There are over 80 developed system wells on the Forests having an output of about 1.8 acre-feet/day (657 acre-feet/year).

11. LANDS

Public Issue

No public issue specifically addresses lands.

Current Management Situation

Landownership. There are a variety of complex landownership patterns within the boundaries of the Shasta-Trinity National Forests. This diversity of ownership results from disposals of land under a variety of public land and mining laws enacted before and after the Forests' establishment. The Timber and Stone Act, Homestead laws, General Mining Laws, grants to schools, and railroad land grants are examples. A large portion of the Shasta-Trinity National Forests has a "checkerboard" ownership pattern which is a result of the railroad grants.

The complex landownership pattern can diminish the effectiveness and benefits that can be derived from the Forests. The intermingled ownership results in increased costs for boundary line establishment and maintenance, the need for right-of-way acquisition, complexity of fire protection and general administration, occupancy trespass, a demand for special uses, and increases in complexity of other basic realty management and protection responsibilities.

Conversely, the need to consolidate in areas where the intermingled lands are large tracts of single private owners may not be needed when there are advantages of retaining the mixed ownership pattern, and there is an opportunity to promote better land use of the total area through coordinated efforts with the private landowner. Simplification of ownership may be of secondary importance when considered with respect to achieving an ownership mix that will maximize overall benefits to the public.

There are approximately 631,000 acres of non-Federal ownership within the boundaries of the Shasta-Trinity National Forests. This represents about 22 percent of the gross acreage. Approximately 20 percent is in large ownerships and 2 percent in small ownerships. Management problems include:

Large Ownerships:

a. Require a large and expensive landline location program and rights-of-way program; and

b. There have been disagreements over road maintenance responsibilities and standards in using joint road systems.

Small Ownerships:

a. Preference for privacy substantially increases the difficulty in acquiring needed rights-of-way;

b. There may be attempts by residential occupants to eliminate logging trucks from roads crossing their property;

c. There may be attempts by landowners to restrict/control forest management practices on adjacent National Forest land;

d. Landowners may expect high quality maintenance on National Forest access roads;

e. Landowners may desire or need to use adjacent National Forest land for private uses; and

f. Inadequate surveys improperly locate private landlines.

Land exchange is the principal method for accomplishing landownership adjustments. The Forests' land adjustment program is the vehicle used to develop and implement a coordinated program of adjusting ownership patterns to optimize the public benefits and administrative effectiveness of the Forests, consistent with private landowner's needs. Land exchange proposals must be mutually agreeable to the Forest Service and the private landowner; neither can force an exchange on the other. The land adjustment program has varied from a low of 700 acres acquired in 1989 to a high of about 30,000 acres in 1982.

The major portion of the Forests' large landownership adjustment program, during the past 12 years, has been with Santa Fe Pacific Timber Company (formerly Southern Pacific Land Company). In addition, exchanges with Roseburg Resources Co., John Hancock Mutual Life Insurance Company (successor to Champion International), and Sierra Pacific Industries (successors to Santa Fe Pacific Timber Company) have been completed as well as numerous small exchanges with individual owners.

During the Carter Administration, there was a proposal to do an interchange with the Bureau of Land Management (BLM). However, most of the lands managed by the BLM are outside of the National Forest boundary, and there is no authority to acquire these lands. At present, there is a land exchange going on with the State of California for lands in and around Castle Crags

Wilderness and various isolated parcels in the Shasta and Trinity National Forests.

Non-Recreational Special Uses. The Forests' ownership pattern necessitates that some occupancy and use of National Forest lands be permitted so that private or other public lands can be appropriately developed or used. Special use permits are issued, when proper, upon compliance with reasonable conditions for the protection and administration of the National Forests.

The issuance of special use permits can affect some management activities on the Forests. For example, there may be restrictions on logging or aerial spraying of herbicides near domestic water developments. Some problems related to special uses are loss of land for other forest uses, erosion or other resource damage from inadequate maintenance, and inadequate funding for proper on-the-ground administration. Currently there are about 800 non-recreation permits, half of which are for roads. These permits occupy about 3,000 acres of National Forest lands.

Withdrawals. Forest lands are withdrawn from mineral entry when they are near roadside zones or administrative, recreation, and power sites. Some lands are also withdrawn by Congress or at the U.S. Department of Agriculture level for wildernesses, research natural areas (RNAs), and wild and scenic rivers. In compliance with Public Law 94-579 (Section 204), each agency level withdrawal is reviewed in conjunction with the Secretary of the U.S. Department of the Interior to determine whether the withdrawal should continue and for how long. The law required that the reviews be completed by October 21, 1991. The review has been completed for the Shasta-Trinity National Forests, and recommendations have been submitted to the BLM. Final action by that agency has not yet been taken. Currently there are 276 withdrawals that encompass 927,000 acres. Of these acres, 920,290 are for wilderness, power, wild and scenic rivers or the Whiskeytown-Shasta-Trinity National Recreation Area (NRA).

The only significant management problem related to withdrawals concerns power-sites. They must be revoked or vacated by the Secretary of the Interior on those lands transferring to private ownership through an exchange. This has delayed some exchanges because the process usually takes at least two years.

Rights-of-Way. There is a continuing need to acquire rights-of-way for all improvements, such as roads and trails, over private or other lands not administered by the Forest Service. The acquisition document is usually an easement deed. The objective is to acquire rights-of-way adequate for the protection, administration, and utilization of the National Forests or, where necessary, for the use and development of the resources upon which communities within or adjacent to the Forests are dependent. Right-of-way acquisition varies from 4 to 30 cases per year; the average is about 15 cases per year.

Occupancy Encroachment. A significant number of occupancy encroachment cases is being discovered in conjunction with the landline program. The encroachments vary from minor uses to significant improvements and/or structures. Some encroachments will qualify and can be resolved under the Small Tracts Act (Public Law 97-465). This Act was passed by Congress on January 12, 1983.

Land Line Location. There are about 3,100 miles of property line boundary between National Forest administered land and private property. Nearly 40 percent of the mileage is surveyed and posted to standard. The remaining property lines will be surveyed and posted as funding allows. Approximately 150 miles of landline have been surveyed annually during the last five years.

Transportation and Utility Corridors. Three major corridors have been identified on the Shasta-Trinity National Forests:

a. Interstate 5-Sacramento River Corridor;

b. Oregon-California Gas/Power Transmission Intertie Corridor; and the

c. Trinity Highway-State Route 299 Corridor.

These corridors contain many land uses including pipeline transmission, electrical transmission, railroads, State and Federal highways, and water-oriented recreation. No single-purpose use can be identified within any one corridor.

Electronic Sites. Eleven designated multi-user electronic sites make up the existing network on the Forests. Each of these sites has the potential for expansion. A management requirement for electronic sites is to maintain separation of uses to avoid interference.

Illegal Occupancy. There are many illegal occupancies associated with mining claims on the Shasta-Trinity National Forests. Most of these occupancies occur on the Trinity side. Persons are considered in trespass when they construct and/or use residences or other facilities on mining claims when such facilities are not essential for exploration and development of those claims. They are clearly in trespass when there is no evidence of valuable mineral deposit within the intent of mining laws. To be authorized, occupancies must be covered by an approved plan of operations according to the regulations found in 36 CFR 228.

Hydroelectric Power. Hydroelectric power is the major energy resource associated with the Forests. The Pit River contains five power houses operated by PG&E with a

combined maximum capacity of 627 megawatts of power. The Bureau of Reclamation operates the Shasta Dam with a maximum capacity of 625 megawatts and Trinity Dam with a maximum capacity of 100 megawatts of power. Water from the McCloud Reservoir is diverted to the Pit River operation via Iron Canyon Reservoir. Water is also diverted from Trinity Lake to Whiskeytown Lake via the Judge Francis Carr Powerhouse. In addition to these large developments, there are four exempted (from FERC licensing) small hydro projects and one licensed small hydro project on the Forests, all west of the I-5 corridor. There are four small hydro projects on private land in the Big Bend area east of the I-5 corridor and south of the Pit River. Only three small projects are being considered for development; all of them are on the Trinity side.

Management Opportunities

Large landowners, such as timber companies, are aware of the management and economic benefits resulting from mutually agreeable land exchanges. Consequently, there are more opportunities for large exchanges than can be handled in the future. There are also many opportunities for small exchanges with individual landowners.

Long-range landownership adjustment planning is needed to supplement management direction in the proposed Forest Plan and to make visible the role of land adjustment actions in support of resource management.

The anticipated future outlook is for an increasing number of special use permits as private lands within the Forests' boundary are more intensively developed.

About 100 miles of road and 45 miles of trail rights-of-way are still needed for the existing transportation system. The mileage will increase slightly until the transportation system is basically completed in about 20 years. The existing right-of-way acquisition program should be completed in 10 years.

Numerous peaks and ridges in the Forests could be used as electronic sites. Seven of these have been identified for expansion of the electronics site network, should the need arise.

Opportunities for small hydro development are numerous, especially west of the I-5 corridor. The natural features of the area, such as high gradient streams draining large watersheds, make the Trinity side attractive. Other factors such as local environmental concerns, reduced tax breaks, lack of capacity on existing transmission lines, and high construction costs reduce the viability of many opportunities.

12. LAW ENFORCEMENT

Public Issue

No public issue was raised dealing with law enforcement.

Current Management Situation

Shasta-Trinity National Forests personnel administer their responsibilities for regulating and protecting National Forest lands under Title 36 of the Code of Federal Regulations (CFRs) and appropriate sections of Titles 16, 18, and 21 of the United States Code.

According to the U.S. Constitution the authority and responsibility to protect citizens and their property and the general police power is reserved to the States. Except in specific areas, the States have delegated their general police powers to city police departments or local county sheriffs.

While the Forest Service does not assume the sheriff's responsibilities in such matters, it is essential that the Agency continues to provide and enforce 36 CFRs which govern public behavior. Specific examples relate to the rights, safety, and enjoyment of other users in full partnership with local law enforcement agencies.

Although only a small percentage of visitors and users on the Shasta-Trinity National Forests commit violations, the number of law enforcement incidents is rising steadily due to an increase in the following:

a. visitors and users;

b. conflicts between users;

c. enclaves of lawlessness on National Forest and adjacent lands;

d. users involved in illegal activities; and

e. the trend toward increased criminal activity in areas suffering from economic depression or uncertainty.

The Shasta-Trinity National Forests have cooperative law enforcement agreements with Shasta, Siskiyou, Tehama, and Trinity Counties. The services provided by the Sheriffs of these counties protect recreation users and their property. These services are reimbursable under the Jurisdiction Act of August 10, 1971, (Public Law 92-82) from National Forest appropriations. The Forests have good working relationships with all four County law enforcement agencies.

Shasta-Trinity National Forests' personnel also cooperate routinely with other State and Federal agencies such as the California Department of Fish and Game, California Highway Patrol, Federal Bureau of Investigation, U. S. Marshal's Office, and various drug enforcement agencies.

Local law enforcement agencies are small and operate with constrained budgets. Incidents and crimes normally associated with urban areas, such as robberies, assaults, burglaries, narcotics trafficking, and cannabis cultivation, occur on the Forests and are increasing. This situation leads to limited resources and delayed responses by responsible agencies, which in turn can expose Forest officers and visitors to potential personal risk.

Management Opportunities

The time-tested success of the philosophy that all Forest Service employees have law enforcement responsibilities will continue and will be strengthened.

The increase in volume and seriousness of law violations and the complexity and diversity of law enforcement situations occurring on the Forests today requires professional law enforcement support. This support requires that additional employees be trained and equipped to function in a full law enforcement capacity.

13. MINERALS

Public Issue

One public issue relates to minerals. That issue is:

How can mineral development and exploration be encouraged while minimizing adverse impacts to non-mineral surface resources? *(Public Issue #8)*

Discussion of Public Issue

Mineral development is permitted on all lands not withdrawn from mineral entry. These rights are subject to prior existing rights in wildernesses. The United States Mining Laws (30 U.S.C. 21-54) confer a statutory right to enter upon public lands to search for minerals. Regulations found at 36 CFR 228 Subpart A set forth the rules and procedures so as to minimize adverse environmental impacts on National Forest resources. In particular, part 228.8 sets forth requirements for environmental protection, including reclamation. A combination of regulations and standards and guidelines define the bounds for developing the mineral resource. They call for operating in an orderly and environmentaly sound manner.

Current Management Situation

Forest Service policy is to encourage mineral exploration and development. The Forest Service integrates the development and use of mineral resources to the fullest extent possible under the laws governing mineral disposal.

The prospecting, locating, and development of mineral resources within National Forests is authorized by the Organic Act of June 4, 1897. The Act also allows the Secretary of Agriculture to set rules and regulations in connection with operations authorized by mining laws. These regulations, which minimize adverse impacts on the resources or define procedures, can be found in 36 Code of Federal Regulations (CFR) 228 - Subpart A - Locatable Minerals, 36 CFR 228 - Subpart C - Disposal of Mineral Materials, 36 CFR 228-Subpart E-Oil and Gas Resources, and 36 CFR 293.14, Mineral Leases and Mineral Permits (in wilderness).

The delegated authority to manage locatable and leasable mineral resources is retained by the Secretary of the Interior. More specifically, the Department of the Interior, Bureau of Land Mangement (BLM), has the major role in issuing and supervising operations on mineral licenses, permits, and leases. The principal authorities which relate to the exploration and development of the leasable minerals (i.e., oil and gas and geothermal) are: (1) The Mineral Lands Leasing Act of 1920; (2) The Mineral Leasing Act for Acquired Lands of 1947; and (3) The Geothermal Steam Act of 1970, as amended. Oil and Gas and Geothermal leasing is administerd by the BLM through a competitive and non-competitive leasing system.

The Federal Onshore Oil and Gas Leasing Reform Act of 1987 authorized the Secretary of Agriculture to develop regulations (36 CFR 228-Subpart E) governing leasing for oil and gas resources, including bonding and reclamation requirements, within the National Forest System. This activity was formerly exercised by the BLM. These regulations ensure effective compliance with applicable environmental protection statutes, as well as meeting the intent of the Leasing Reform Act.

Agreements embodied in Memorandums of Understanding between the Secretaries of Agriculture and Interior that share various work processes are found in Forest Service Manual (FSM) 1500, External Relations. The authority for the management and disposal of mineral materials including, but not limited to, common varieties of sand, stone, gravel, pumice, pumicite, cinders, and clay lies with the Forest Service. The detailed authorities and direction for locatable minerals, mineral leasing, and mineral sales are in FSM 2800, Minerals and Geology.

Access for mineral exploration and development is generally unrestricted, subject to the mitigation of adverse impacts to surface resources. Exceptions to unrestricted access are wildernesses, Wild portions of Wild and Scenic Rivers, botanical areas, Research Natural Areas (RNAs), the National Recreation Area (NRA), and areas which are withdrawn from mineral entry. Minerals in the NRA are not locatable but they are leasable.

Access to wilderness, the NRA, and other lands withdrawn from mineral entry, for mineral related activities, is subject to valid existing rights. The type of access authorized must be consistent with proposed use and of a type that will maintain the special character of the area to the extent possible.

Noteworthy minerals in the Forests, based on past and present mining or exploration interest, are gold, limestone, copper, zinc, iron, manganese, chromite, barite, oil and gas, geothermal energy, sodium, and rock aggregate.

Locatable Minerals

Gold. Gold is the primary mineral of interest involved with prospecting and mining on the Forests. Average gold prices for the last seven years have ranged between $350 and $450 per troy ounce. Thus, the number of

exploration and mining operations has remained relatively stable. Since gold deposits on the Forests are not the high volume/low grade deposits amenable to cyanide heap leaching, there has not been the large increase in gold production that has occurred elsewhere in the western United States.

There are a large number of small, active placer gold mining operations in the streams flowing through the alluvial gold-bearing areas of Shasta and Trinity Counties. Many operations use suction dredges to recover the gold from the placer deposits. Dredge size varies from 2 to 12 inches in intake diameter, with 3 to 6 inches being the most common. Some placer deposits are mined using heavy equipment. High investment needs and operating costs are major deterrents to these larger operations.

Lode deposits, by contrast, are those containing veins or mineralized zones in consolidated bedrock and not alluvial placer deposits. These deposits were historically mined in the Hayfork, Upper Canyon Creek and east and west Shasta massive sulfide Districts. Prospecting, exploration or mining activities continue to occur in these areas as well as the area southwest at Mt. Shasta.

Despite inadequate statistics on the subject, it is obvious that gold mining is economically significant in areas of the Shasta-Trinity National Forests. The gross retail sales of mining equipment and supporting vehicles amount to many thousands of dollars annually. To this may be added the sales of gasoline, spare parts, tires, supplies, and accessories, as well as the repair and maintenance services required.

The relatively stable price range of gold should continue to support ongoing mining operations. The small dredging operations on the Forests will probably continue at about the same pace.

Limestone. A 50 to 100 million-ton limestone deposit has been identified southeast of Hayfork. There are several other good limestone deposits around Shasta Lake. Past interest in the limestone deposit near Hayfork indicates that it could be mined for use in sugar processing when market conditions improve. The deposit is too far from sugar refineries to be economically competitive with other limestone sources at this time.

Iron. A 30-million-ton iron deposit (34 percent iron) has been identified in the Shasta Unit of the NRA. The deposit is on a highly visible point which is seen from Interstate 5; this portion of the lake is heavily used by recreationists. No plans have been made to allow for the development of the iron deposit at Shasta Lake.

Copper/Zinc/Barite. The east and west Shasta copper/zinc districts extend onto National Forest lands west and south of Shasta Lake. A copper deposit has been identified at Bully Hill. Barite deposits have been mined near Girard Ridge where the potential for new discoveries still exists. No mining activity is anticipated for the known deposits of copper, zinc, and barite because of the current market and economic situation.

Manganese/Chromite. Both manganese and chromite ore were mined from the Forests during the two World Wars and the Korean Conflict for the purpose of increasing Federal stockpiles. Development of these minerals was heavily subsidized by the Government for war purposes, but the deposits are probably subeconomic at the present time. The minerals are considered strategic because the United States imports more than 50 per cent of its needs from foreign sources. The local deposits could become valuable during National emergencies.

Leasable Minerals

Oil and Gas. No oil or gas deposits are known to exist in the Forests. Young, sedimentary sections, particularly the Hornbrook formation, are prospective source rocks for the origination of hydrocarbons. Not until one or more exploratory wells are drilled through the thick layer of volcanic and sedimentary rocks on the east side of the Shasta Forest will it be known whether the area is a hydrocarbon source.

The Federal Onshore Oil and Gas Leasing Reform Act was passed in 1987. Subsequent to this Act, the United States Department of Agriculture, Forest Service, promulgated regulations 36 CFR 228 Subpart E on January 9, 1990. Part 228.102(b), Scheduling Analysis of Available Lands, requires that Forest Supervisors shall develop, in cooperation with the BLM and public input, a schedule for analyzing lands under their jurisdiction that have not been already analyzed for leasing. The Forest Supervisors shall revise or make additions to the schedule at least annually. Part 228.102 (c), Leasing Analyses, defines the procedure in detail and states that the analysis shall be conducted in accordance with the requirements of 36 CFR 219 (Forest Land and Resource Management Planning) and/or, as appropriate, through preparation of NEPA documents.

Analysis for the development of potential oil and gas deposits on the Forests will be done upon receipt of an application for development and/or as funding is available. In either case, the analysis will comply with NEPA requirements.

Geothermal Energy. Geothermal energy is the natural heat of the earth captured by means of superheated steam, hot liquid, or hot dry rocks in reservoirs at depths ranging from a few hundred feet to over ten thousand feet. This energy is legally specified as a mineral resource. The eastern portion of the Forests (Shasta side) is of recent volcanic origin with lava flows, cones,

volcanic vents, and hot springs. As such, there may be potential for the presence of geothermal resources.

The Geothermal Steam Act of 1970 (Public Law 91-581), as amended, authorizes the Secretary of the Interior to issue leases for the exploration, development, and utilization of geothermal resources on National Forest lands.

The Shasta-Trinity National Forests have existing geothermal leases in or adjacent to the Glass Mountain Known Geothermal Resource Area (KGRA) located near Medicine Lake. Most of the KGRA is on the Modoc National Forest. All leases in a designated KGRA are issued through a competitive bidding process. This designation in itself suggests a high potential for the presence of geothermal resources.

Fifty percent of the rental fees, bonus bids, and royalties derived from oil and gas or geothermal leases is placed in the Federal Treasury. The other 50 percent is returned to the State. Forty percent of the State's share is then dispensed to the County of origin.

Sodium. There is an inactive sodium lease on the Trinity Forest. The deposit may eventually be mined.

In contrast to mineral activities, authorized by the Mining Law of 1872, the leasing of leasable minerals (oil, gas, geothermal, sodium, and hard rock minerals existing on acquired lands or within an NRA), is a discretionary action of the Secretary of Interior. The removal of leasable minerals is authorized only by a lease. If an application for lease is received, the Forest Service makes a recommendation to the Department of the Interior as to whether a lease should be issued and whether special stipulations should be required. Post-lease activities are managed by the BLM through a permit process.

Future oil, gas, and geothermal activities are unknown.

Common Variety Minerals

Forest personnel have completed a rock aggregate inventory. This inventory is a compilation of the location of past and present rock pits, pertinent test information, and estimates on the quantity and quality of material available. This inventory can be used to assess the availability of rock aggregate throughout the Forests. Removal of common variety minerals materials is regulated by 36 CFR 228, Subpart C by issuance of a mineral materials permit.

Based upon historical data in the use of aggregate for various types of surfacing, the Shasta-Trinity National Forests use 60,000 to 75,000 tons of aggregate each year. Much of this aggregate comes from sources on land administered by the Forests.

Meaningful estimates on the quantity of earth borrow used on the Forests are impossible to determine. Most earth borrow is used in roadway construction and is balanced to minimize waste between excavation and embankment for each project.

The mineral materials involve discretionary actions on the part of the Forest line officers and may be disposed of by free use permit, negotiated sale, or competitive sale. These activities are managed by the Forest Service through a permit process.

Based on past use and trends, it appears that the Forests will use between 50,000 and 65,000 tons of aggregate per year for the next 10 to 20 years. It is anticipated that much of this material will continue to come from sources on National Forest lands.

Withdrawals, Mineral Reservations, and Outstanding Rights

Withdrawals from mineral entry are restricted to Wildernesses, developed recreation sites, RNAs, Wild portions of the Wild and Scenic Rivers System, the NRA, and administrative sites such as offices and work centers. There are 927,000 acres currently withdrawn in all categories. Restoration of a withdrawal to mineral entry will be requested when the need for it ceases to exist. Mineral activities within withdrawals are subject to valid existing rights obtained prior to date of withdrawal.

There is a small amount of acreage of outstanding mineral rights on the Forests with considerable variation in the type of reservation. These reservations are considered in the management of the surface resources on a case-by-case basis.

Management Opportunities

Mineral development will be a permitted activity on all prescriptions except Prescription X, Special Area Management, and Prescription XI, Cultural Resource Management. The right to develop minerals will continue to be subject to prior existing rights in withdrawn areas, primarily Prescription V, Wilderness Management.

Future mineral development depends on having reasonable access to deposits covered by mining claims or leases. The Forests' can accommodate this need through approved plans of operation when such plans are required under 36 CFR 228. Miners can use Forest roads the same as other members of the public, subject to the Secretary's rules and regulations.

If there are changes in the demand for traditional forest uses, there may be a corresponding increased future need to withdraw certain areas from mineral entry. These areas would be withdrawn in order to maintain other public values or to reserve an area for a particular public purpose or program (e.g., campgrounds, administrative sites, and RNAs). Such actions reduce the opportunity for mineral development. Withdrawal should, therefore, be done carefully on a selective basis and only where the need to protect the public value of the special feature outweighs the potential mineral values foregone. The 1990 RPA target (estimate) for the decade 1990-2001 was 109 plans of operation per year. Expectations for the future are for less activity for the following reasons:

The California Wilderness Act of 1984 withdrew 483,618 acres of Shasta-Trinity National Forests land from appropriation or disposition under the mining laws and mineral leasing laws. The withdrawal mainly affects locatable minerals on the Forests.

No new mining claims may be located within wildernesses, and no new ground-disturbing exploration or prospecting activities may be conducted. All existing claims within a wilderness must contain a verifiable discovery as of September 28, 1984. If a discovery has not been exposed within the limits of the claim prior to the withdrawal date, the claim is not valid. Plans of operation for invalid claims within a Wilderness cannot be approved. As such, prior to approving a plan of operations providing for mineral activities within a Wilderness, a determination will have to be made as to the validity of any claimed rights.

About seven plans of operation have been approved each year for mining activities within what is now the Trinity Alps Wilderness. These plans are approved only when prior existing rights have been determined.

Geothermal lease applications have already been filed on all known areas of geothermal potential within the Forests. Many of these leases, which were on the slopes of Mt. Shasta, have been vacated. Few new applications are expected to be processed in future years.

14. RANGE

Public Issues

Two major issues have emerged with regard to range:

a. **Is livestock grazing an appropriate use of wilderness? If so, how should conflicts be minimized between livestock use and recreationists?** *(Public Issue #9)*

b. **How should livestock grazing be managed to minimize degradation of riparian areas?** *(Public Issue #10)*

Discussion of Public Issues

a. Livestock Grazing/Wilderness.

There are nine livestock grazing allotments within, or partially within, the Trinity Alps Wilderness.

Allotments within the Trinity Alps Wilderness administered by the Shasta-Trinity National Forests are:

- Big Bar - 30 head from 6/1 to 10/31;
- Battle Canyon - 42 head from 7/15 to 10/15;
- Union Creek - 40 head (temp) from 7/15 to 10/15;
- Trinity River Allotment - Inactive.

Allotments partially within the Trinity Alps Wilderness administered by the Klamath are:

- Carter Meadow - 31 head from 7/16 to 10/15;
- South Fork - 32 head from 7/16 to 10/15;
- Granite Fox - 36 head from 7/16 to 10/15;
- Eagle Creek - 40 head from 7/16 to 10/15;
- Mill Creek - 50 head from 7/16 to 10/15.

Livestock grazing on these allotments is a continuation of use that predates the establishment of the Trinity Alps Wilderness.

b. Livestock Grazing/Riparian Areas.

Within the lands grazed by livestock are many miles of streams and numerous lakes, ponds, springs and wet meadows. There are about 25,000 acres of riparian areas within the grazing allotments on the Forests. Because of the proximity of water, livestock tend to graze in and/or near these riparian areas. Without proper management, this could result in overgrazing and in a reduction in riparian resources.

Current Management Situation

Historically, livestock grazing on public land reached its peak during the late 1800s and declined over the next 50 years. The decline in permitted stock on public land was largely a result of a reduction in livestock numbers (primarily sheep) to achieve proper stocking rates. In addition, more reliance on family-owned ranching operations led to decreased demand.

About 2,350 head of cattle, 2,120 sheep, and 45 horses graze under permit on 26 allotments on the Shasta-Trinity National Forests. These figures total 8,245 animal months (AM). (NOTE: An AM is one month's use and occupancy of the range by one animal.) There are five empty grazing allotments on the Forests. Twenty-nine permittees are dependent upon the Forests' range resource to complete their ranching operations. An additional 585 AMs of grazing, for 195 cattle, are permitted on seven (five within Wilderness and two outside) allotments administered by the Klamath National Forest. Parts of these allotments are located within the Shasta-Trinity National Forests. This use involves four additional permittees.

There are 245,834 acres of National Forest lands suitable and/or potentially suitable (may need investment-type improvements) for grazing (see **Table III-10**). This total includes: transitory range (177,583 acres), primary range (51,521 acres) and secondary range (16,730 acres). If all the land suitable or potentially suitable for grazing was made available, more than 72,900 AMs could be realized. This figure consists of 46,390 AMs from transitory range, 21,070 from primary range, and 5,460 from secondary range. These outputs assume 1,000 pounds of forage per AM, using 50 percent of the current annual growth for plant viability and taking into account reductions for wildlife forage. Such outputs also assume the need for additional investments for water, distribution, and other needs.

Table III-10 further describes current capabilities and suitabilities of livestock grazing areas on the Shasta-Trinity National Forests. Conditions of this range vary from poor to good, with 5 percent being poor, 70 percent being fair, and 25 percent being good.

Less livestock grazing over the past decade has resulted in improved range land conditions in some areas. Only about one-third of the suitable range land is grazed because of the low demand for livestock grazing in this area.

Primary and secondary ranges consist of meadows, glades, and grasslands ranging from open types to open-timber/bunchgrass types on slopes under 40 percent. Most of the latter type occurs on the north-central and northeastern portions of the Shasta National Forest. Mt. Shasta and McCloud Ranger Districts have significant

areas of open park-like grazing lands. While some natural encroachment by trees is occurring, these areas should remain suitable as forage areas for decades to come.

Most transitory range exists as a result of recent regeneration cutting or other timber management activities. These activities have opened up the overstory tree canopy, allowing the establishment of a forage base of grasses, forbs, and browse.

Most of the allotments on the Forests (except Mt. Shasta and McCloud) occur predominately on transitional ranges which include some scattered grass/forb openings or parks. A reduction in the amount of land being managed for timber production will reduce the amount of area in early seral stages (grass/forb/young browse). This, coupled with the in growth of timber stands into areas previously cut, will reduce the overall amount of available/suitable transitory range land.

Table III-10
Summary of Forage Capability, Suitability and Productivity of Range Types

	Dry Meadows Glades	Moist Wet Meadows	Sage-brush	Bitter-brush	Ponderosa & Jeffrey Pine	Oak Wood-land	Grass-land	Misc *	Total
Estimated Lbs./Acre	**500**	**600**	**200**	**500**	**450**	**300**	**500**	**475**	-
Primary Range, Acre	7,951	8,524	-	776	5,265	26,536	2,469	-	51,521
Secondary Range, Acre	690	-	756	1,339	13,945	-	-	-	16,730
Transitory Range, Acre	-	-	-	-	-	-	-	177,583	177,583
Total Range/Acre	**8,641**	**8,524**	**756**	**2,115**	**19,210**	**26,536**	**2,469**	**177,583**	**= 245,834**
Estimated Current Forage Productivity (M Lbs./Acre)**									
Primary Range:	3,975	5,144	-	388	2,369	7,961	1,235	-	21,072
Secondary Range:	345	-	151	670	6,275	-	-	-	7,441
Transitory Range:	-	-	-	-	-	-	-	84,352	84,352
Total Potential Productivity (M lbs./Acre) Estimated AMs* **	**4,320**	**5,144**	**151**	**1,058**	**8,644**	**7,961**	**1,235**	**84,352**	**= 112,865**
Adjusted Potential Productivity **** (M Lbs. Acre)									
Adjusted Estimated AMs	2,376	2,829	83	581	4,754	4,378	679	46,393	= 62,073
Potential Forage Productivity Increase (25%) Over adjusted Productivity (M Lbs./Acre) *****									
Primary & Secondary Range:	594	707	21	145	1,189	1,095	170	-	= 3,921
Transitory Range:	-	-	-	-	-	-	-	11,598	11,598
Total Potential Productivity (M Lbs./Acre) Potential Adjusted AMs	2,970	3,536	104	726	5,942	5,472	849	57,991	= 77,590

* Includes Chaparral, Bitterbrush, Ponderosa pine, Jeffrey pine, and mixed conifer.

** M Lbs./Acre = 1,000 pounds per acre.

*** AMs = animal months; total potential productivity from all range lands.

**** Total potential productivity from all suitable range land i.e. adjustments made for slope, remoteness, wildernesses, distance to water, access, vegetative quality, and allotments managed by the Klamath National Forest.

***** 25 percent productivity increase was calculated for primary and secondary ranges only. For transition ranges, two adjustments for potential forage productivity were made: (1) 75 percent reduction was applied to existing transition range due to intensive timber management practices; and (2) additional productivity amounts were added back in for brush conversion.

Livestock grazing problems on the Shasta-Trinity include: (1) grazing within high use recreation areas and wilderness where there is a potential conflict with recreational and other resource values, and (2) grazing within riparian areas where there is a potential conflict with sensitive plants and other riparian values.

The Shasta-Trinity National Forests have had very few predation problems associated with any livestock allotments. Over the last ten years, there have been no requests by permittees to bring in or provide for any type of predator control measures. Should such problems arise in the future, the Forests would work through the existing process and appropriate agencies to provide for such an effort.

Management Opportunities

It is expected that the demand for Forest range lands will remain at, or decrease slightly from, current levels over the next decade. If increased demand for range land should occur, it could be accommodated in some areas by the development of suitable range that would not be in conflict with other resource uses. Costs of development could be shared between the permittee and the government, thereby increasing the feasibility of such improvements.

Most poor and fair range conditions and damaged riparian habitats can be improved by using management practices such as: shifting or establishing grazing systems, fencing riparian pastures, developing site specific allotment management plans, and combining or changing allotment boundaries.

Few opportunities exist for increased or re-established grazing within the Trinity Alps or Yolla Bolly-Middle Eel Wildernesses.

15. RECREATION

Public Issues

Two major public issues emerged with regard to recreation:

a. **How much of the Forests should be open, closed, or restricted to off-highway vehicle (OHV) use?** *(Public Issue #11)*

b. **How should the Forests supply water-oriented recreation facilities and opportunities to meet increasing demand?** *(Public Issue #12)*

Discussion of Public Issues

a. **Off-highway Vehicle Use.** Concerns have been expressed that OHV use can cause damage to soil, water and wildlife resources. The use of OHVs has increased while the lands open to this use have decreased. In addition, conflicts can occur between various OHV users and other recreationists.

b. **Water-oriented Recreation.** There is a statewide public need for additional water-oriented recreation activities. The Forests have the potential to supply most forms of such recreation. However, the current supply of support facilities will not meet estimated demand. Use conflicts can occur between various types of recreationists.

Current Management Situation

The Shasta-Trinity National Forests are recognized nationally for the wide variety of outstanding recreation opportunities they provide. Other Federal agencies, State and local governments, and the private sector also share in the type of recreation activities offered.

Recreation on the Forests can best be described in terms of supply and demand. Supply is the quantity of recreation facilities or settings available for visitor use. In the case of developed sites, supply is expressed in terms of capacity. This is determined by the number of camping units or parking spaces available. For dispersed recreation, supply is expressed as a mixture of settings that are conducive to various activities. The recreation opportunity spectrum (ROS) is used to describe recreation settings offered; they range from primitive to rural. The recreation setting supply is measured in acres within each ROS class.

Demand for recreation is more difficult to determine than supply. Demand varies according to numerous factors associated with the preferences of recreationists and the settings offered. One indication of probable demand, which is easily measured, is recreation use. Current and projected use levels give an estimate of the recreation settings that may be needed in the future.

Recreation Supply

Recreation Opportunity Spectrum (ROS). ROS is a system that inventories National Forest lands for a variety of existing and potential recreation opportunities based on the size, distance from roads, and degree of development of a given area. The ROS classes pertinent to the Shasta-Trinity National Forests are: Primitive (P), Semi-primitive Non-motorized (SPNM), Semi-primitive Motorized (SPM), Roaded Natural (RN), and Rural (R). These are defined in the Glossary in Chapter VIII.

Inventoried SPNM and SPM categories include the majority of the 306,060 acres (within 29 areas) that were released for non-wilderness resource management under the 1984 California Wilderness Act. (Refer to the Wilderness and Roadless Areas Section in this Chapter and to the Recreation Section in Chapter IV).

Current inventoried acres, recreation use, and potential capacity by ROS class are shown in **Table III-11.**

Table III-11
Recreation Opportunity Spectrum

ROS Class	Acres	1989 Recreation Use	Potential Capacity (PAOT)*
Primitive (P)	498,776	231,000	12,469
Semi-primitive Non-motorized (SPNM)	25,514	131,500	2,551
Semi-primitive Motorized (SPM)	544,139	696,500	136,034
Roaded Natural (RN)	1,052,498	1,757,100	2,631,245
Rural (R)	620	1,916,500	6,200

* PAOT - People-at-one-time

Recreation Resource Information System (RRIS). Recreation inventory and use data on the Forests has been collected for over 30 years. The advent of the Recreation Information Management (RIM) System in the mid-1960s developed a valuable data system; however, RIM was abandoned in 1987. The Recreation Resource Information System (RRIS) is currently being developed to meet a growing need for inventory and other data needs for the Forest recreation program. A strong commitment to better data collection, as well as thorough demand analysis, is needed for future planning updates.

Developed Recreation Facilities. Developed sites include campgrounds and picnic areas, observation and interpretive sites, fishing areas, boating and swimming sites, trailheads, recreation residences, marinas and resorts. The ROS settings include the semi-primitive (motorized and non-motorized) and roaded settings (roaded natural and rural).

Approximately 1,300 acres are allocated to developed recreation areas on the Forests. These include: 81 campgrounds with 1,355 camping units; 20 picnic areas with 127 units; 14 parking areas for boaters; 3 day use swim areas; and 20 resorts and marinas. The total capacity of developed recreation facilities, estimated by the number of PAOT multiplied by the season of use (days), is 1,147,500 PAOT-days.

Developed recreation use (1.5 million recreation visitor days [RVDs]) is at 65 percent of the theoretical maximum capacity for developed facilities (2.3 million RVDs). Regional standards state that if a Forest's developed facilities are reporting use greater than 40 percent of the theoretical maximum capacity, demand is exceeding supply. Some developed sites on the Forests are overcrowded and many are in poor condition. Most of the Forests' campgrounds were designed and constructed 30-50 years ago and are not suited to today's recreational pursuits. Recreation budgets have not kept pace with facilities maintenance and reconstruction needs. It is estimated that 90 percent of the developed recreation facilities on the Forests are operated below standard.

Downhill ski facilities were in operation in the ski bowl on Mt. Shasta between 1957 and 1978. Studies for possible redevelopment were delayed pending final wilderness allocation of the California Wilderness Act of 1984. An environmental statement was completed in 1988. The Record of Decision selected an alternative involving development of downhill skiing on 1,950 acres of National Forest land on Mt. Shasta, with the potential to serve 4,800 skiers-at-one-time (SAOT).

A new Record of Decision will be issued for the ski area developer when the updated review and analysis are completed. This review will determine the eligibility of Mt. Shasta for the National Register of Historic Places. A decision on subsequent appeals required the Forest Service to complete a supplemental environmental analysis. Following completion of this document in 1990, several lawsuits were filed objecting to redevelopment of downhill skiing. A decision by the U.S. District Court on the first issue addressed in court proceedings has directed the 1990 Record of Decision to be subject to administrative review (appeals). Following completion of the current review and analysis of the eligibility of Mt. Shasta (and/or specific sites on the mountain) for the National Register of Historic Places, a new Record of Decision will be issued announcing the start of the administrative review period. Following completion of the appeal process the original lawsuits may or may not be refiled in the U.S. District Court.

Mt. Shasta Ski Park, located on a lower-elevation section of private land, became operational for the 1985/1986 ski season. It has an estimated capacity of 2,000 SAOT.

Dispersed Recreation Settings. Dispersed recreation settings include Forest roads and highways, backcountry areas, rivers, lakes, streams and wildernesses. The ROS settings include the primitive, semi-primitive (motorized and non-motorized) and roaded settings.

Roaded settings include scenic byways, highways, wild and scenic rivers, lands adjacent to timber harvest areas, and many lakes within the NRA. Developed recreation sites are generally located within the roaded settings. In addition to the developed sites, there are opportunities for many kinds of dispersed recreation. Because roaded settings are located on relatively gentle terrain with abundant access, most of the total acreage within the setting is usable. The Forest has two designated scenic byways and potential for at least three additional routes.

Semi-primitive settings include wild and scenic rivers, large lakes and backcountry areas. These settings provide remoteness, challenge, and solitude. Some of these areas are managed for motorized travel by boat or OHV. Other areas are managed for non-motorized travel by foot, horseback or mountain bike. Location, access, and attractions affect the semi-primitive areas level of use. As with developed sites, some semi-primitive areas are lightly used. Other areas attract enough use so that crowding and user conflicts occur. In these settings, terrain and trail access may limit the usable area. Although total acreage may be high, recreation use might be concentrated along a trail or shoreline. Over the past ten years the need to manage dispersed sites has become important in popular areas in order to accommodate more people and maintain a quality experience for all user groups. Support facilities, in the form of parking, signs, and sanitation facilities, have been inadequate.

Many semi-primitive areas on the Forests have desirable attractions, but use is limited. These areas generally lack an identity, adequate signing, or published information.

Therefore, many potential visitors turn toward more publicized, Congressionally designated areas like NRAs and Wildernesses.

The largest and most remote backcountry areas are classified as primitive. All of the primitive ROS settings on the Forests are within Congressionally designated Wildernesses. There are five Wildernesses on the Shasta-Trinity National Forests: Castle Crags, Chanchelulla, Mt. Shasta, Trinity Alps and Yolla Bolly-Middle Eel.

The Forests' OHV Plan designates 239,175 acres to cross-country travel. An additional 1,383,596 acres restrict OHV use to existing roads and trails because of highly erodible soils, steep terrain, critical wildlife habitat or other resource conflicts. About 500,000 acres on the Forests are closed to OHVs, primarily because of wilderness designation.

A Draft Statewide OHV Motor Vehicle Recreational Trails Plan has been developed for the State of California Department of Parks and Recreation. This plan presents the concept of a statewide OHV trail system that connects use areas to provide opportunities for long distance trail touring. Although the State Plan identifies specific route locations, it recognizes that the actual route may vary. Existing OHV trails and low-standard roads can serve as part of the statewide system and provide long distance touring opportunities. There are 4,300 miles of road on the Forests that are ideal for OHV travel. Lands designated as semi-primitive motorized would be managed to provide a primitive recreation experience while maintaining motorized access.

Recreation Demand: Current and Projected Use

The Shasta-Trinity National Forests include 212,000 acres of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA). The NRA was established in 1965 by Public Law 89-336. It is one of only 16 NRAs nationwide. Legislation provides that administration of the NRA be carried out under separate management plans. These plans are to be reviewed and revised periodically.

Recreation use on the Shasta-Trinity National Forests is extremely high when compared to other national forests in the United States. It ranks among the top 10 in the nation. An estimated 4.1 million recreation visitor days (RVDs) occurred in 1989; this figure does not include 0.7 million RVDs related to hunting and fishing. This use is the result of unique and abundant recreation opportunities which are easily accessible from Interstate 5, the primary north/south transportation corridor for the West Coast. I-5 passes directly through the Shasta Unit of the NRA and in close proximity to the Castle Crags Wilderness and the Mt. Shasta Wilderness and Recreation Area. Between Shasta Lake and Mt. Shasta the interstate parallels the upper Sacramento River. From I-5, State Highway 299 west provides access to the Trinity Scenic Byway, the Trinity Unit of the NRA, the Trinity Alps Wilderness, and the Trinity Heritage Scenic Byway.

The current (1989) recreation use of 4.1 million RVDs is distributed as follows:

Developed Recreation (Public)--15 Percent. This includes campgrounds, group campgrounds, and picnic areas.

Developed Recreation (Private)--10 Percent. This includes facilities under special use permit, such as resorts, campgrounds and recreation residences.

Dispersed Recreation--70 Percent. This includes boating, hiking, car camping, backpacking, pleasure driving, horseback riding, cross-country skiing, snow play, river rafting, mountain biking, and OHV use.

Wilderness--5 Percent. This includes hiking, backpacking, horseback riding, camping, mountaineering and rock climbing.

Patterns and distribution of recreation use on the Forests fluctuates during periods of drought.

The 1989 RPA document, "An Analysis of the Outdoor Recreation and Wilderness Situation in the United States: 1989-2040", lists 11 activities that are expected to exhibit the greatest growth in the number of recreational trips away from home. In order from greatest to least are: pleasure walking, pleasure driving, picnicking, stream/lake/ocean swimming, family gatherings, pool swimming, wildlife observation and photography and other outdoor photography, motorboating, bicycle riding and day hiking. Of particular interest is the projected growth in demand to the year 2040 for the following water and snow activities: 27 percent increase for motorboating and 233 percent increase for downhill skiing. The Shasta-Trinity National Forests will play a major role in meeting these increasing recreational demands.

Additional private sector demand is expected in the areas of downhill skiing, outfitter guide services, and resorts. This increased demand is addressed in various NRA Plans, wilderness plans and other environmental documents. Currently, there are over 1,000 recreation special use permits authorized on the Forests. These include resorts/marinas, boat docks, houseboats, campgrounds, and recreation residences. The majority of these permits is located in the NRA. The demand for use of five existing recreation residence tracts is expected to continue. However, the tracts occupy prime recreation lands adjacent to Shasta Lake and the South Fork Trinity River. This situation puts the tracts in direct competition with recreation uses which would serve a greater segment of the

public. Periodic review of the demand for public use versus existing exclusive uses will be necessary through future use studies.

Management Opportunities

An intensive and innovative recreation program is necessary to resolve resource management needs, people management needs, and the competition for diverse but ample recreation opportunities. One way to meet this challenge is to emphasize the unique opportunities offered by various geographic theme areas. This approach would disperse recreation use throughout the Forests, and would more fully utilize the many recreation opportunities (including interpretation of resource management practices for visitor education). Many of the opportunities listed in the theme areas correspond directly to the growth areas listed in the previously mentioned RPA document. In addition, many partnership opportunities exist along the major Forest travel corridors (Interstate 5, State Highways 36, 89, 97, and 299) that could involve cooperative efforts between private businesses and public agencies (County, State and Federal).

Recreation Theme Areas. The conceptual organization of the recreation potential of the Shasta-Trinity National Forests into theme areas presents a framework for examining management opportunities over the next five decades. Twelve geographic recreation theme areas are listed in **Table III-12.** These theme areas respond directly to projected recreation demand increases identified in the 1989 USDA Forest Service RPA Assessment. The objective is to identify and develop unique recreation experiences and activities offered by each theme area rather than to provide identical activities in all locations.

The potential exists, depending on funding levels and visitor demand, to promote some or all of the theme areas to a greater or lesser extent, including developed and/or dispersed support facilities, interpretation and environmental education. The potential also exists to identify and promote additional recreation opportunities offered by each theme area but not currently being used.

Primary development opportunities would be promoting recreational potential at the rural community interface. With sociological studies showing a trend by the American public to favor shorter recreation trips, day trips, and scenic driving tours (all close to community centers) opportunities abound for development of city-to-forest hiking, equestrian and OHV trails, "pocket" parks, and environmental education activities at the community interface. In areas where paved or well-maintained native-surface transportation corridors are located, the opportunity exists for promoting and interpreting scenic driving tours, botanizing, and wildlife viewing, for example, in the Trinity Divide and Medicine Lake Highlands areas.

Table III-12
Recreation Theme Areas

Major Theme	Recreation Opportunities
Rural Community Interface	City-to-Forest hiking and mountain bike trails, developed day use (pocket parks, group sites, day trips, unique sites), environmental education and interpretive programs, partnerships with local businesses
Trinity Divide & Castle Crags	Dispersed car camping at lakes, high country summer/winter hut system, rock climbing, wilderness and non-wilderness backcountry
Mt. Shasta Recreation Area and Wilderness	Visitor Information Center/Conference Center/Elderhostel, interpretation (volcanic, Native American, reforestation), winter sports (skiing, snowmobiling), wilderness mountaineering, scenic drives
McCloud River (upper, reservoir, lower)	Riverside trail hiking, scenic tours, Visitor Information Station, coldwater fishing, developed sites
Medicine Lake Highlands	Volcanic interpretation, scenic tours/byway mountain biking, snowmobiling, dispersed spelunking, hunting
Main Fork Trinity River	Highway access to river opportunities (kayaking, rafting, recreational mining, group camping, river side biking), Trinity Scenic Byway, steelhead and salmon fishing, Visitor Information Station
Trinity Alps Wilderness	Wilderness backcountry travel, wilderness education, alpine lake activities (photography, swimming, fishing)
Yolla Bolly & Chanchelulla Wildernesses/Tedoc Mountain	Day trips, unique sites, equestrian use, wilderness backcountry travel, old growth forest
South Fork Trinity River/Chinquapin	River/forest solitude, fishing, spelunking, trails, old growth forest (environmental education, watershed)
Shasta Unit of the NRA	Developed sites, Visitor Information Center, interpretation, handicapped access, low-water access, lakeshore hiking trails, OHV site, cold and warmwater fishing, water sports, house boating, commerical resorts and marinas, spelunking
Trinity Unit of the NRA	Developed sites, Visitor Information Station, interpretation, handicapped access, low-water access, lakeshore hiking trails, cold and warmwater fishing, water sports, house boating, commercial resorts and marinas
Scenic Byways	Trinity Heritage Scenic Byway, Mt. Shasta Scenic Highway (Everitt Highway), Proposed Mt. Shasta Byway, Trinity Scenic Byway (State Highway 299), Proposed Modoc Volcanic Scenic Byway (Proposed State Highway 36 West Scenic Byway) Red Bluff to Pacific Coast

16. RIPARIAN AREAS

Public Issues

One major public issue focuses on riparian areas:

How wide should riparian management zones (RMZs) be and what management activities should be allowed within them? *(Public Issue #13)*

There are three related issues:

a. **How should livestock grazing be managed to minimize degradation of riparian areas?** *(Public Issue #10)*

b. **How should the Forests supply water-oriented recreation facilities and opportunities to meet increasing demand?** *(Public Issue #12)*

c. **What river segments should be recommended for inclusion in the Federal Wild and Scenic Rivers System?** *(Public Issue # 20)*

Discussion of Public Issues

Riparian Management Zone Width. Some of the most productive, sensitive, and diverse sites on the Shasta-Trinity National Forests are within riparian areas. All aquatic and riparian ecosystems, floodplains, and wetlands are included within the defined riparian area. These areas are adjacent to streams and other bodies of water and include adjoining areas that need special management for the protection of riparian vegetation and streamcourses.

Valley inner gorges, the over-steepened slopes immediately adjacent to some streamcourses, are highly sensitive and management activity within them is generally avoided to protect riparian and water resources.

Just as streams flow together to form a connected network of flowing streams and rivers, so do the riparian areas adjacent to the streams. Aquatic and riparian ecosystems of ephemeral and intermittent streams are also a part of the entire system, even when surface water does not flow in their channels. Changes in these ecosystems are reflected in changes in downstream ecosystems over a period of time. Protection of ephemeral and intermittent streamcourse riparian areas not only provides protection in place, but also protects the integrity of interconnected downstream riparian areas.

Management objectives within riparian areas are directed toward maintenance and improvement of the riparian ecosystem and protection of streamcourses, water quality, and wildlife habitat. Timber management and other nondependent resource practices are, therefore, not emphasized. The publication "Water Quality Management for National Forest System Lands in California" includes several Best Management Practices (BMPs) specific to management of riparian areas. These BMPs are used for the riparian areas identified in project planning.

In order to protect water quality and, subsequently, riparian areas, one BMP requires that RMZs be defined in terms of boundaries and appropriate management activities. RMZs provide a "buffer" between riparian areas and forest management activities. Timber management within a RMZ varies according to conditions such as surface erosion potential, mass wasting potential, beneficial uses, wildlife habitat values, and stream character. Accordingly, harvest prescriptions can vary from the retention of noncommercial vegetation within 50 feet of a channel to full retention of all vegetation within hundreds of feet of a channel.

Related Issues

a. **Livestock Grazing in Riparian Areas.** Refer to the discussion of this public issue in the Range Section of this Chapter.

b. **Increasing Demand for Water-Oriented Recreation.** Refer to the discussion of this public issue in the Recreation Section of this Chapter.

c. **Wild and Scenic River System.** Refer to the discussion of this public issue in the Wild and Scenic Rivers Section of this Chapter.

Current Management Situation

There are about 2,000 miles of perennial streams, 3,500 miles of intermittent streams, and 53,000 acres of lakes and reservoirs within the Forests. For perennial streams, lakes, and reservoirs riparian areas generally comprise the area within 100 feet of the high water mark. For nonperennial streams, wet meadows, and marshes riparian areas are usually within 50 feet of the channel or standing water. Using these standard widths the estimated extent of riparian areas on the Forests is approximately 67,000 acres. Actual acreage will be mapped during future inventory work and at the project level to ensure full protection. These inventories will include information not only on the extent of the riparian area, but also on the conditions within the area. This information will be used in planning management

activities within riparian areas to benefit the riparian-dependent resources.

Existing riparian area uses include habitat for fish and other aquatic ecosystem life-forms and wildlife habitat, including some life-forms that live exclusively in riparian areas.

Inter-related riparian-aquatic ecosystems found within these areas provide important habitat elements for fish species such as cover, temperature control, substrate composition, and water quality and quantity.

Riparian areas provide important habitats for many wildlife species including the California red-legged frog, willow flycatcher, fisher, and bald eagle.

Riparian areas and their forested surroundings are a critical link for maintaining wildlife species diversity and abundance. Birds use riparian areas more than the adjacent upland habitat. Twenty-five percent of the local mammals are dependent or highly associated with riparian habitat. Most amphibians require aquatic or semi-aquatic conditions for reproduction. A few reptiles, such as the western pond turtle and aquatic garter snake, require aquatic systems. Refer to Appendix G for a list of species highly associated with riparian and aquatic ecosystems.

In addition to providing aquatic and terrestrial habitats, riparian areas are often the focus of water-related recreation uses. Some developed recreation sites, such as campgrounds, are within riparian areas. Trails for nature study, wildlife viewing, and sightseeing often include riparian areas. Other uses are for livestock foraging and watering, water developments for a variety of consumptive and nonconsumptive uses, and production of wood products.

The wide array of riparian area uses often results in conflicts between these uses. Livestock over-use damages aquatic and wildlife habitats. Timber harvesting and road building have caused damage that limits the use of riparian areas for other resources. On the other hand, the exclusion of management activities in riparian areas results in the loss of wood products and livestock production. Management activities within riparian areas should consider these and other conflicting uses. Preferential consideration is given to riparian area dependent resources over other resources and activities when conflicts arise.

Past land management activities have been inconsistent in the application of riparian area resource management. Consequently, there is a wide diversity of riparian area conditions throughout the Shasta-Trinity National Forests. An estimated 5,000 acres of the total 67,000 acres of riparian areas on the Forests are in a degraded condition and in need of rehabilitation. Riparian areas may adjust to disturbance over time, with some vegetation and streamcourse stability returning to a nearly undisturbed condition within years or decades.

The condition of the Forests' riparian areas varies from sites that have never been disturbed, to areas which have already recovered or are in the process of recovering from disturbance. Other areas are in need of restoration efforts to help them recover more quickly. Only where drastic changes have occurred has there been a long-term loss of riparian area. Road construction, recreational developments, large landslides, cattle over-grazing, and mining activities have produced most of these changes.

Due to the proximity of over-steepened inner gorge slopes to riparian areas, disturbance of the inner gorge and any associated landslide has devastating effects on the riparian dependent resources. Current direction is to manage inner gorge lands as protective zones for riparian areas. Riparian areas, including inner gorges, riparian ecosystems, and wet meadows, are identified during project-level planning.

Management Opportunities

Nearly all of the resources on the Forests are putting an ever-increasing demand on the lands within riparian areas. Because of this, there is a need for increased coordination of uses so that the quality of the riparian areas can be maintained. Future management opportunities will focus on the maintenance and improvement of riparian ecosystems.

Shasta-Trinity National Forests' personnel use BMPs for the protection of water quality, as described in the most current version of "Water Quality Management for National Forest System Lands in California." These BMPs provide for watershed and riparian area improvement and the conduct of land-disturbing activities in a manner that will not result in the pollution of water from nonpoint sources.

Improved application and implementation of these BMPs will be necessary in the future to avoid the degradation of riparian resources that has occurred in the past. To that end a Forest Supplement to the BMP Handbook has been developed. It describes additional measures which can be used to protect riparian habitat and water quality. Use of these BMPs will also minimize future conflicts and provide for the protection or enhancement of riparian areas.

In addition to BMPs, special management standards and guidelines are directed toward protecting riparian areas and providing additional wildlife habitat benefits. These include increased snag densities, dead and down

material, overstory cover, and older over-mature timber stands.

In addition, new measures have been prescribed for riparian ecosystems (refer to Management Prescription IX [Riparian Management]). These measures are meant to address nine specific goals. RMZs are prescribed for all streams, lakes, ponds, reservoirs, and wet areas. These RMZs range from 150 to over 300 feet in width for each side, depending on site conditions. Site conditions include such things as surface erosion potential, landslide potential, beneficial uses, wildlife habitat values, and stream character. Specific standards and guidelines define appropriate practices within and adjacent to RMZs.

Implementation of the new riparian ecosystem standards and guidelines will offer greater protection for riparian areas in the future. This increased protection, in conjunction with management opportunities emphasizing riparian ecosystem restoration, will result in improved riparian area conditions throughout the Forests.

17. SOILS

Public Issue

No major public issue focuses specifically on soils.

Current Management Situation

Soils are the basic resource that support or directly influence most, if not all, other resources. This support is through soil productivity for wood, forage, or habitat vegetation. Influence is provided by a complex of numerous soil and environmental characteristics.

The soil types on the Shasta-Trinity National Forests range from very low to high in productivity. Soil productivity is defined as the capacity of the soil to produce a plant community or sequence of plant communities under a specified system of management. The factors that influence the productivity of the soil are: soil depth, percent rock fragments, texture, available water-holding capacity, nutrient status, maintenance of the duff layer, mineral toxicity, and pH. Other environmental factors are: precipitation, aspect, slope gradient, and elevation.

A total of 105 different soil types have been identified in the Shasta-Trinity National Forests. Dubakella, Deadwood, Goulding and Etsel are typical examples of soils that range in timber productivity from low to unsuitable (50 to less than 20 cubic feet/acre/year). They are very shallow to moderately deep with 40 percent to 90 percent coarse fragments by volume. Unsuitable soils and soils of low productivity comprise about 42 percent of the Forests' land base.

Typical examples of soils of moderate timber productivity (50 to 85 cubic feet/acre/year) are Neuns, Speaker, Marpa, and Washougal. They are moderately deep to deep with 20 to 60 percent coarse fragments. Soils of moderate productivity comprise about 41 percent of the Forests' land base.

Boomer, Hugo, Shasta, and Cohasset are examples of soils of high productivity (more than 85 cubic feet/acre/year). They are deep with coarse fragments with less than 40 percent of the volume. Highly productive soils are found on about 17 percent of the Forests' land base.

A Soils Resource Inventory (SRI) has been completed for the Shasta-Trinity National Forests. This SRI is an Order 3 (reconnaissance) level survey which is suitable for displaying Forest soils and their general location for broad land management planning. This inventory is not intended for project level planning or layout. Soil/Water Resource Specialists in the Forest Supervisor's Office or those on the Ranger Districts provide soil information and management prescriptions. They also recommend mitigation measures for project planning.

The greatest threat to the maintenance of soil productivity is erosion--both sheet and gully. Almost any soil is subject to erosion if a sufficient amount of surface water flow is present. Some soils have a higher propensity to erode than others. Examples of highly erodible soils are: Howtow, Chawanankee, Chaix, and Oval; they have developed from coarse-grained granitic bedrock.

About 195,000 acres on the Shasta-Trinity National Forests have a high to very high erodibility factor. Several management tools are used to prevent unacceptable soil loss resulting from management activities. These tools include: (1) an Interagency Erosion Hazard Rating system for identifying soil erosion hazards; (2) Management Guidelines for granitic soils for controlling management activities; and (3) Soil Quality Standards (SQS) which require the amount and kind of ground cover to be retained for soil protection.

Soil productivity criteria were used extensively in suitability modeling for various resource uses. An example of soil inputs into suitability modeling for timber is shown in Appendix I of the proposed Forest Plan.

All the soils on the Forests are capable of maintaining their productivity over time if they are protected from erosion or degradation from logging or site preparation.

Management Opportunities

There will be an increased need to manage the soil resource so that the highest yields are realized, while at the same time protecting basic soil productivity.

An Ecological Unit Inventory (EUI) is in progress on the Shasta-Trinity National Forests. The goal of EUI is to provide land managers with project level maps and data elements that accurately integrate geology, soils, and vegetation into ecological landscape units with management interpretations. This provides the basis of Ecosystem Management. The survey and coordination is performed by an interdisciplinary team of professionals.

The Soil Quality Standards (SQS) are threshold values that are being established to protect soil productivity from significant change or impairment of the soil's productivity capacity through land management practices. Long term impairment or soil change can occur in several ways:

Compaction results in a loss of porosity which reduces the rate at which water can enter and pass

through the soil. Compaction influences the ability of tree roots to respire, which, in turn, reduces tree or other vegetative growth. Guidelines call for soil porosity to be within 90 percent of its natural condition.

Loss of Organic Matter. The duff layer is the primary source of nutrient replenishment. There is a need to improve upon current knowledge of soil behavior in relation to forest management activities. Duff and other woody debris provide much of the ground cover necessary to protect the soil from erosion. As the duff decays, it is carried down into the surface horizon, forming the dark humus layer. Humus has a very high nutrient and water-holding capacity. Guidelines call for approximately 50 percent of the disturbed area to be uniformily covered with organic matter.

Loss of Large, Woody Material. Large, woody material (greater than 16 inches in diameter and 10 feet or longer) provides habitat for microorganisms, insects, and small animals that convert nutrients into usable forms and spread nitrifying bacteria. Guidelines call for 5 to 20 logs, in varying degrees of decomposition, per acre in contact with the soil.

Soil Erosion. The degree and rapidity with which a soil will erode is dependent on many factors: soil texture, structure and rock fragments, the amount of ground cover, and the degree of compaction. The guidelines indicate that management activities should be modified and enough ground cover maintained to provide for low to moderate erosion hazard ratings.

The Forest Service has completed a soil moisture/seedling survival study and a soil fertility study on a variety of plots in Northern and Central California. The results of this study will be used to identify opportunities for increasing productivity.

There is a program in place to monitor the implementation and effectiveness of the SQS.

18. SPECIAL AREAS

Public Issue

One public issue is related to Special Areas. That issue is:

What areas should be recommended for Research Natural Area (RNA) and Special Interest Area (SIA) establishment? *(Public Issue #14)*

Discussion of Public Issue

Research Natural Areas (RNAs)

Through research National Forest administrators can understand the Forests' resources better, and, consequently, they are able to manage them more appropriately. For more than 50 years, the Forest Service has participated in the creation of a RNA system in the United States. The first Federally recognized RNA was established on the Coronado National Forest in 1927.

The objectives of RNAs include the following:

1. To contribute to the preservation of examples of significant natural ecosystems for purposes of research, education, and maintenance of biological diversity. Land use patterns are changing so quickly that some ecosystems may essentially disappear before they can be studied.

   RNA targets are identified by vegetation type and physiographic province. The majority of the Shasta-Trinity National Forests lie in two physiographic provinces, the Klamath Mountains and the Cascade Range. A small percentage of the Forests lies in three other provinces: the Modoc Plateau, the Great Valley, and the Coast Range. The RNA system is intended to include representative examples of common, widespread vegetation types in each province and unusual or unique types.

2. To maintain natural genetic diversity. Both ecological and economic stability require conservation of gene pools.

3. Where appropriate, to protect habitats of threatened, endangered, and sensitive plant and animal species for research purposes. The life histories and ecological relationships of most of the Forests' rarest plants and animals are still poorly understood, and this hampers effective recovery of these species.

4. To provide benchmarks for forest management activities. RNAs serve as undisturbed baselines for measuring the effects of management practices on similar areas.

   RNAs are not recreation areas. In fact, recreational use may be incompatible with RNA objectives.

Special Interest Areas (SIAs)

The Forest Service is mandated by law and policy to designate special areas with outstanding natural, recreational or cultural values as SIAs. Management objectives for SIAs are: (1) to protect these outstanding values; and (2) to encourage public use and enjoyment of the areas so long as such use is not detrimental to the values being protected.

SIAs may be established for scenic, historical, geological, botanical, zoological, paleontological, or other special characteristics. Recreational developments within SIAs such as trails, sanitary facilities, and picnic grounds are kept to the minimum needed for public enjoyment of the area.

Current Management Situation

Research Natural Areas (RNAs)

The Pacific Southwest Region's RNA Committee has identified several gaps in the array of natural habitat types represented in the California RNA system. In addition, new target types were added in 1990 as a result of a refinement in the classification of non-forested ecosystems. A list of RNA targets and their correlation with RNA candidates on the Shasta-Trinity National Forests is shown in Appendix F.

Only one RNA, the Shasta Mud Flow RNA, is established on the Shasta-Trinity National Forests. Approximately 3,703 acres (3,115 acres, net) were designated as the Shasta Mud Flow RNA by the Chief of the Forest Service in 1971. This RNA represents young growth Pacific ponderosa pine (Society of American Forester's cover type 245) for the Cascade Physiographic Province and the scientific geologic values of a volcanic mud flow.

Fourteen areas have been screened and found to be viable candidates for RNA status. Nine of these are recommended for establishment. See **Table III-13.**

Following is a brief description of the research values for each of those 14 areas:

1. Bald Mountain Creek. The Bald Mtn. Creek area was proposed by the Citizens for Better Forestry as a RNA to serve as a completely undisturbed benchmark watershed representative of other adjacent watersheds under timber management. The Bald Mtn. Creek watershed would be monitored as a control watershed.

2. Bear Creek. The Bear Creek area was proposed as a RNA to serve as a monitoring benchmark watershed to determine the effects of management activities on highly erodible granitic soils. The Bear Creek watershed would be monitored as a control watershed.

3. Cascade. The Cascade area was proposed to meet the requirements for the red fir vegetation type (SAF 207) in the Cascade Range Physiographic Province. This area gets heavy recreation use winter and summer; this use is incompatible with RNA objectives.

4. Cedar Basin. This area best fulfills the Port-Orford-cedar vegetation type (SAF 231) target within the Klamath Mountains Physiographic Province. Other botanic elements represented within this area include the Sierra Nevada mixed conifer (SAF 243) and the Darlingtonia bog vegetation types. The basin contains excellent examples of inland Port-Orford-cedar in both pure and mixed stands between 5,400 to 6,400 feet.

At least two beneficial research objectives could be met: (1) because of infestation of many of the coastal Port-Orford-cedar stands by Phytophtora lateralis and the possibility of further spread in the coastal areas, these stands may provide the best opportunities for protection of the species from the fungus; and (2) these stands of Port-Orford-cedar provide additional genetic material for off-site testing to determine relative susceptibility and resistance of individual trees to P. lateralis. The area also includes a large number of plant communities and 11 different species of conifers.

5. Devils Rock-Hosselkus. The Devils Rock portion of the RNA fulfills the California black oak vegetation type (SAF 246) target within the Klamath Mountains Physiographic Province. The oak stands are dense, and there is little diversity of woody shrubs and herbaceous vegetation. Most of the California black oak (Quercus kelloggii) trees in this area are 40 to 80 years old, although much older monarchs are present. The complex geology in this area adds to the ecological-vegetational values.

The Hosselkus portion does not specifically meet a terrestrial vegetation target. The area is being proposed primarily for the unique paleontological values found in rich abundance in the limestone formations here. Also, it is known that unique edaphic features often give rise to unique biological entities. The recent discovery of a previously unknown relict shrub species, the Shasta snow-wreath (Neviusia cliftonii), growing in the limestone formation, is an indication of the area's uniqueness and is proof of its value for research opportunities. Moreover, the limestone formations support several distinctive ecosystems, containing suitable habitat for the Shasta salamander (Hydromantes shastae), a sensitive species, and Shasta eupatory (Eupatorium shastense), a limestone-dependent plant endemic to the Shasta-Trinity National Forests. The area also satisfies secondary vegetation targets for California black oak (SAF 246), Sierra Nevada mixed conifer (SAF 243), and Pacific ponderosa pine/Douglas-fir (SAF 244) types within the Klamath Mountains Physiographic Province. The area has been a focal point for paleontologists since 1895.

6. Manzanita Creek. Although this area was proposed to meet the RNA target for Pacific ponderosa pine/Douglas-fir (SAF 244) vegetation type for the Klamath Mountains Physiographic Province, its strongest value is its diversity of vegetation types. The SAF 244 type is also represented by the proposed Smoky Creek area on the Hayfork District. Other target elements represented here include white fir (SAF 211), Pacific Douglas-fir (SAF 229), and Sierra Nevada mixed conifer (SAF 243) vegetation types. Past fires in the area have created a high diversity of subclimax plant communities.

The proposed RNA boundary encompasses the entire watershed within the Trinity Alps Wilderness. Some 4,000 acres of the watershed were disturbed by the Treloar Fire of July, 1985. There is a gauging station available for controlled watershed studies.

7. Murphy Glade. The Murphy Glade area was proposed to meet the requirements for the red fir vegetation type (SAF 207) in the Klamath Mountains Physiographic Province. Haypress Meadows RNA, proposed by the Klamath National Forest, also fulfills the red fir target for this province.

8. Mt. Eddy. The proposed area fulfills the target requirement for foxtail pine for the Klamath Mountains Physiographic Province. The Mt. Eddy foxtail pine population covers 240 acres within the proposed RNA. The foxtail pine population in this area is large and healthy and represents an excellent example of this target. The need for this target is high. No other RNA proposals within this physiographic province contain significant populations of foxtail pine.

Deadfall Basin, which was included within an earlier boundary for this RNA, is recommended instead for SIA status because of its existing recreational use. Several populations of sensitive plants could be included in this RNA if its boundaries were expanded to the north. This land is now in private ownership but will likely be acquired by the Forest Service.

9. Preacher Meadows. The area meets the Sierra Nevada mixed conifer forest cover type (SAF 243) target for the Klamath Mountains Physiographic Province. The

need for this target is moderate to high. Undisturbed samples of adequate size in commercial timber stands are difficult to locate in the Klamath Mountain Province. The darlingtonia bog and the California lady's-slipper (Cypripedium californicum) add to the value of the area.

10. Red Butte-Red Fir Ridge. The area meets the RNA requirements for the red fir vegetation type (SAF 207) in the Cascade Range Physiographic Province. It represents the undisturbed conditions occurring at the higher elevations of the red fir range. A secondary element of the California mixed subalpine forest (SAF 256) is also found within the area. This area is the only one within the Pacific Southwest Province that is being considered to meet the red fir target. The RNA is entirely within the Mt. Shasta Wilderness. Recreational use primarily affects Squaw Creek meadows but not the red fir target.

11. Rough Gulch. The proposed Rough Gulch RNA area contains a Douglas-fir/giant chinquapin/beargrass community. This area appears to be different from the communities within the Pacific Douglas-fir vegetation type (SAF 229) represented by the proposed South Fork Mountain RNA. Many of the chinquapins in the Rough Gulch area are in excess of 3 feet diameter at breast height (dbh) and 100 feet or more tall. The area would meet the target requirements for the Pacific Douglas-fir vegetation type (SAF 229) for the Klamath Mountains Physiographic Province. The area has secondary targets which are representative of the Pacific ponderosa pine/Douglas-fir vegetation type (SAF 244) and the beargrass community. The preferred boundary encompasses the entire Rough Gulch watershed, and includes populations of two sensitive plants: Umpqua green gentian (Frasera umpquaensis) and pale yellow stonecrop (Sedum laxum ssp. flavidum).

12. Smoky Creek. This area was first proposed to meet the RNA target for Pacific ponderosa pine/Douglas-fir (SAF 244) in the Klamath Mountains Physiographic Province. However, Jeffrey pine type (SAF 247), also is well-represented here and is an unmet primary target for the RNA network. The Pacific ponderosa pine/Douglas-fir type is represented in the proposed Manzanita Creek RNA. Therefore, the focus of the proposed Smoky Creek RNA has shifted to encompass the Jeffrey pine that grows on serpentine soil. The proposed RNA boundary follows the perimeter of the North Fork Smoky Creek watershed and includes all of the watershed below the Bramlet Road (FS Road 29).

13. South Fork Mountain. The area meets the Pacific Douglas-fir vegetation (SAF 229) target for the Klamath Mountains Physiographic Province. No sensitive plants are known to grow in this area. This target could be

Table III-13
Candidates for Research Natural Areas

Area Name	Size (Acres)	Management Area	Ranger District
1. Bald Mountain Creek	800	10	McCloud
2. Bear Creek	4,500	17	Hayfork
3. Cascade	2,000	3	Mt. Shasta
4. * Cedar Basin	1,160	5	Mt. Shasta
5. * Devils Rock-Hosselkus	5,550	12	Shasta Lake
6. * Manzanita Creek	7,250	4 (Trinity Alps)	Big Bar
7. Murphy Glade	1,260	22	Yolla Bolla
8. * Mt. Eddy	890	5	Mt. Shasta
9. * Preacher Meadows	1,850	4 (Trinity Alps)	Weaverville
10. * Red Butte-Red Fir Ridge	1,640	4 (Mt. Shasta)	McCloud
11. * Rough Gulch	3,960	20	Hayfork/Yolla Bolla
12. * Smoky Creek	960	19	Hayfork
13. South Fork Mountain	1,180	20	Yolla Bolla
14. * Stuart Fork	1,500	4 (Trinity Alps)	Weaverville
Total	34,500		

satisfied by the establishment of the Rough Gulch RNA described above.

14. Stuart Fork. The area appears to meet the targets for montane chaparral for the Klamath Mountains Physiographic Province. Good examples of this vegetation type are extremely difficult to find in suitable sizes and in an undisturbed state. The major drawback with this area is the difficult access. Conversely, location of the area within the Trinity Alps Wilderness would maintain the undisturbed conditions found here.

Special Interest Areas (SIAs)

There are no established SIAs on the Shasta-Trinity National Forests. However, several places on the Forests have attracted public interest because of their special features. Examples include limestone caves, waterfalls, volcanic craters, fossil localities, and serpentine plant communities. Nineteen areas are being recommended for formal establishment as SIAs. Another 22 candidate areas are being considered as potential SIAs. Where boundaries are unclear or resource conflicts exist, currently used areas are proposed for SIA evaluation during the Plan period (see Management Opportunities below).

Table III-14 lists the 19 areas recommended for SIA designation. Each is described briefly below:

1. Bigelow Meadow. This is a large, intact riparian meadow system adjacent to the McCloud River. The meadow lies within the upper McCloud River recreation area. Wildlife diversity is high.

2. Black Butte. This cinder cone is one of the most visible landmarks on the Forests; it lies adjacent to Interstate 5. However, most people driving by probably do not know that it is part of the National Forest system.

3. China Mountain. Located along the crest separating the Shasta and Klamath National Forests, this botanical SIA includes both China Mountain and South China Mountain. Foxtail pine and whitebark pine communities, and a large number of rare and sensitive plant species, are its outstanding values. Adjacent Klamath National Forest lands are also designated as a SIA.

4. Cory Peak. Cory Peak lies at the south end of the China Mountain/Cory Peak crest zone. The California Department of Fish and Game (DFG) has identified Cory Peak as a significant natural area because of the presence of the Sierra Nevada red fox and several high elevation serpentine endemic sensitive plants. One of these is the State-listed Trinity buckwheat (Eriogonum alpinum). The Klamath National Forest is also recommending Cory Peak as a SIA.

5. Deadfall Basin. The Basin, below the summit of Mt. Eddy, features subalpine vegetation on peridotite, plus several sensitive plants. The southeastern boundary of this proposed SIA adjoins the Mt. Eddy RNA. Access is by the PCT/Sisson-Callahan National Recreation Trail. The area is used by hikers, campers, and wildflower enthusiasts.

6. Deep Crater. This volcano is the largest example of an explosion crater within the Medicine Lake Highlands. Funnel-shapes with scattered rock "bombs" typify these craters. The primary uses are hunting and access to adjacent private lands.

7. Giant Crater Lava Tube System. Located within the Giant Crater Lava Flow is the longest lava tube system in the world; it has a lineal length of about 18 miles. Giant Crater constitutes the largest subsidence crater within the Medicine Lake Highlands. The area has been or is being studied by the U.S. Geological Survey, NASA, and various universities. The primary activity is hunting and access to adjacent private lands.

8. Grizzly Peak. This SIA is located at the boundary of Shasta Lake and McCloud Ranger Districts, six air miles north of Iron Canyon Reservoir. It features a panoramic view, unusual disjunct subalpine vegetation, and several rare and sensitive plants. The PCT traverses this SIA.

9. Kangaroo Ridge. This area is on the boundary of the Shasta and Klamath National Forests. It is identified by the DFG as a significant natural area for its concentration of rare and sensitive plants, including Scott Mountain bedstraw (Galium serpenticum ssp. scotticum). The Klamath National Forest is also recommending this area as a SIA.

10. Little Glass Mountain. This feature is an example of a type of volcano which was formed by repeated overflows of thick lava from a vent at its summit. It is composed of obsidian and rhyolite interlayered with pumice; it is estimated to be between 500 to 1,000 years old. Most of the thick pumice deposits surrounding this mountain originated from it. The primary activities include mining, hunting, and access for timber production on adjacent lands.

11. Natural Bridge. Natural Bridge is the largest limestone bridge on the Shasta-Trinity National Forests. Natural Bridge is a limestone formation riddled with caves; it was the site of a 1852 Wintu Indian massacre. The primary activities are rock climbing and picnicking.

12. Paint Pot Crater. This volcano or cinder cone was formed as a result of the accumulation of red cinder thrown into the air during moderately explosive eruptions about 2,000,000 to 11,000 years ago. Portions of the red cinder were later covered by white pumice blown from Little Glass Mountain, thus giving it a distinctive

"painted" quality. The primary activities are hunting and timber access on adjacent lands.

13. Pumice Stone Mountain. This mountain was formed as a result of the accumulation of cinder thrown into the air during moderately explosive volcanic eruptions. The cinder cone was later covered by a thick mantle of pumice blown from Little Glass Mountain during its eruption. Primary activities include hunting and access for timber harvesting on adjacent lands.

14. Samwel Cave. Overlooking the McCloud Arm of Shasta Lake, Samwel Cave is an extensive series of limestone fissures and openings. The cave was originally researched by paleontologists, producing important late Pleistocene fossils, as well as a few human-made tools. The locale also figures prominently in Native American mythology and is considered a sacred area by present-day Wintu Indians. The site is being recommended for designation as a National Natural Historic Landmark (NNHL) under the auspices of the National Park Service.

15. Scott Mountain. This proposed SIA is located at the Scott Mountain crest, just west of Highway 3. The DFG recognizes this as a significant natural area because of several Darlingtonia seeps and several serpentine-endemic sensitive plants, including the Klamath manzanita (Arctostaphylos klamathensis). The Klamath National Forest is also recommending adjoining land as a botanical SIA.

16. Spatter Cones. These miniature "volcanoes" are formed by hot gasses mixed with molten lava which escaped up through a fissure in the earth's surface. A row of five of these chimney-like spatter cones is located on the northern limit of the Giant Crater Lava Flow. The area is also an archaeological site. Primary uses are hunting and access for timber harvesting on adjacent lands.

17. Tedoc Mountain. This peak is part of the largest of several unique tetonic harzburgite blocks on the Yolla Bolla Ranger District. Rock types range from nearly unaltered dunite to highly serpentinized peridotite. Consequently, the resident soils and plant communities are unique and diverse. The latter are represented by forest, woodland, chaparral, herbaceous and riparian plant associations. There are also relatively barren areas here.

A number of serpentine endemic plant species are resident, including several classified as sensitive by the Forest Service. These botanical features, which characterize the unique geology and soils of the area, constitute the most outstanding special values. The primary activities are hunting, road access to adjacent lands, and botanizing.

18. Toad Lake. Toad Lake is recognized by the DFG as a significant natural area for its lake and wet meadow vegetation on serpentine. It is also recognized for its concentration of sensitive plants, including the riparian-dependent showy raillardella (Raillardella pringlei). Access is by Forest Service Road 40N64 and the PCT. This area gets moderate recreational use.

19. Western Azalea. This botanical SIA was recommended by the Citizens for Better Forestry, an environmental organization. It is a spring-fed riparian plant community with a showy population of the native western azalea; it is located close to the Bramlet Road.

Some of the areas mentioned above may also qualify under the National Park Service's NNHL System.

As previously mentioned, Shasta Mud Flow has been classified as a NNHL. Mt. Shasta has overlapping classifications as a Recreation Area, a National Natural Historic Landmark (NNHL), and a Wilderness. Because of its unique multiple values, Mt. Shasta is discussed as a separate topic following this section.

Management Opportunities

Research Natural Areas

In addition to the areas listed in **Table III-13**, Forest personnel will review additional RNA proposals over the next 5-10 years. The Shasta-Trinity National Forests contain 87 of the elements (ecosystems) that are targeted by the Pacific Southwest Region for investigation, screening, and possible inclusion into the RNA system. Of the 87 elements, 19 are meadow and wetland types; 11 are riparian and bottomland types; 8 are scrub and chaparral types; 1 is a grassland type; 9 are woodland types; 36 are forest types; 2 are alpine types; and 1 is a limestone type.

Forest personnel will consult with the Regional RNA Committee to set priorities for identification and establishment of RNAs on the Forests. The most critical RNA needs identified by the Committee, that could potentially be met on the Shasta-Trinity National Forests, are for Oregon white oak (SAF 233) and Pacific ponderosa pine (SAF 245).

Classification and ranking of RNA targets is incomplete for aquatic, geologic, and biological elements. However, information about the distribution and abundance of these elements, within the State of California, is available through the California Natural Diversity Data Base (CNDDB). This data base was established jointly by The Nature Conservancy and the DFG in 1980. The Shasta-Trinity National Forests' staff consults the Data Base regularly. It helps identify areas suitable for designation as RNAs or for other special management designations.

Special Interest Areas

Many other areas on the Shasta-Trinity National Forests, less well-known by the public, may also be suitable for SIA designation. The following discussion focuses on 22 potential areas, recommended by the public or by Forest Service personnel, as having outstanding special characteristics. The DFG inventory of significant natural areas was also used to generate potential SIAs.

Most of these areas receive little recreation use, largely due to lack of publicity about their special features. Timber resource and mineral values, and other conflicting uses are insignificant. These areas will be evaluated for their suitability as SIAs during the Plan period.

Table III-14 lists the 22 potential SIAs. Each is described briefly below.

1. Big Sand Flat. Big Sand Flat is a Pleistocene lake bed on the McCloud Flats. At first glance it appears to be nearly barren, but on closer inspection there is an unusual community of dwarf lupines, many-flowered gilia, and other herbaceous plants adapted to the sandy soil. Also present is a population of the very rare/sensitive plant Columbia cress (Rorippa columbiae).

2. Blake Mountain. Located about two miles northwest of Blake Mountain, on South Fork Mountain, this meadow area possesses exceptional botanical diversity, as well as fine representative old growth conifers (sugar pine, Douglas-fir, and incense cedar), and their associated plant species in an undisturbed setting. It is part of a string of meadows and springs which run parallel to South Fork Mountain on the northeast side. Suitable habitat occurs here for the sensitive plant Umpqua green gentian (Frasera umpquaensis).

3. Burnt Lava Flow. The majority of this flow lies on the adjacent Modoc National Forest and is classified as a "virgin" area. Approximately 250 acres of the flow extend onto the McCloud Ranger District, on the flanks of Medicine Lake volcano. The flow area encompasses a set of three cinder cones which range from 300 to 500 feet in height; they are referred to as Triad Cones.

4. Cable Creek. This area includes the headwaters of Cable Creek, an area of high botanical species diversity, including many different species of bryophytes. Suitable habitat may exist for the sensitive plant Umpqua green gentian (Frasera umpquaensis). This area may serve as a resource study area for restoration/revegetation projects in nearby riparian areas.

5. Del Loma Cave. This cave is located above the village of Del Loma, along the Trinity River Canyon. It is a small, complex cave about 400 feet long and nearly barren of formations. Crawls connect small rooms, and there are a couple of short, climbable drops. It was reportedly discovered by the Forty-Niners during the years of the Gold Rush. The date 1849 is written on the wall.

6. Dobkins/Durney Basin. The Dobkins and Durney Lakes basin, on the north slope of Mt. Eddy, has a high concentration of sensitive plants on diorite and on serpentine. The area is also noted for its scenic beauty.

7. Dubakella Mountain. Dubakella Mountain was proposed by the California Native Plant Society (CNPS) as a botanical SIA because of its rich flora. It was first described by Dr. Ledyard Stebbins in a 1972 CNPS publication.

8. Hall City Cave. This small, interesting cave is located on Hall City Creek above the old Hall City Mine, three miles east of Wildwood. A 100 foot passage leads to a small lake on a 50 foot long underwater pit.

9. Hirz Mountain. Hirz Mountain is a limestone mass with distinctive flora, including the Shasta National Forest endemic Shasta eupatory (Eupatorium shastense). It is located on the north side of Shasta Lake within the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA).

10. Lower McCloud River Wild Trout Area. The Lower McCloud River is a Class I trout stream. Fish habitat is in excellent condition. Pool:riffle ratio is near parity, and there is an abundance of large, deep pools. Suitable spawning gravel is abundant. The lower 12 miles have been designated as a wild trout stream by the California Department of Fish and Game. This stream has adfluvial and resident forms of rainbow and brown trout which are the dominant fish species. Bull trout is a State listed endangered species which once inhabited the Lower McCloud River. However, no bull trout have been seen since 1975.

11. McCloud Falls. The McCloud Falls lie within a one mile reach of the Upper McCloud River. There are three sets of falls formed as a result of the river eroding through resistant lava flows and highly erodible interflow material. The Upper Falls drop about 40 feet into a relatively large pool. The Middle Falls is actually a continuous cascade extending nearly one-quarter of a mile with a total elevation loss of about 200 feet. The Lower Falls is located within Fowlers Campground. Lower Falls drops some 20 feet into a deep, but moderately sized pool. McCloud Falls is primarily a day use area.

12. McGinnis Springs/Wagon Camp. The McGinnis Springs/Wagon Camp area at the base of Mt. Shasta is a 100-acre complex of meadows, springs, and serviceberry thickets. Only about half of it is in Federal ownership. The area has historical and biological significance because C. Hart Merriam's biological expedition camped at Wagon Camp for about a month in 1898.

Some of the earliest plant collections from Mt. Shasta were made at this time. Merriam's report, Results of a Biological Survey of Mount Shasta, Northern California, was published in 1899 and remains one of the classics of ecological literature.

13. Mount Shasta Scenic Area (Proposed). See Section which follows.

14. New River. The New River area, near the western edge of Trinity National Forest, reportedly supports an excellent example of mixed evergreen forest with two sensitive lewisias and four species of stonecrop (Sedum spp.). New River was proposed for botanical SIA status by the CNPS.

15. Papoose Hill. This is a relatively young cinder cone volcano of basaltic composition located within the even younger Giant Crater Lava Flow. Papoose Hill, about 50 acres in size, is the only undisturbed cinder cone volcano on the southern flank of the Medicine Lake shield volcano.

16. Potem Falls. Potem Falls is an unusually scenic waterfall on Potem Creek, a tributary of the Pit River. The Falls is located at the extreme east end of the Shasta Unit of the NRA.

17. Potter Creek Cave. In 1878, Potter Creek Cave yielded the remains of a new species of extinct bear. About 25 years later, it yielded the largest collection of Pleistocene fossils of any cave in California including remains of elephant, mamoth, camel, and sloth. It is located on Potter Creek on the east side of the McCloud River arm of Shasta Lake; it is reached by boat.

From the south, the large entrance of the cave is a prominent landmark on the north side of Potter Creek Canyon. It sits on the ridge between Potter and Marble Creeks. Its arch is about 25 feet wide and 12 feet high. To the rear, 30 feet inside, a small 70 foot-long passageway leads to an opening high on the eastern wall of the Galgotha Room. A 42 foot ladder descent is necessary. The Galgotha Chamber is 107 feet long and about 30 feet wide at its widest point. The maximum ceiling height is about 75 feet.

18. Tilted Rock Lava Flow. This lava flow, one of the more recent within the area, is estimated to be about 1,000 years old and 1,250 acres in size. It is an example of an 'aa' type lava flow. (See Glossary for definition). Tree molds, created by the advancing lava, remain visible along certain sections. The flow begins north of Pumice Stone Well and terminates at Grasshopper Flat. Much of it has been covered by a more recent pumice eruption.

19. Tombstone Peak Caves and Fossil Locality. This site is located at the divide separating the Sacramento River from Squaw Valley Creek. Little is known about the area except that it is composed of a large outcrop of the McCloud limestone of Permian age. It is reported that the site is rich in fossils and that there are a number of caverns in the outcrop.

20. Trout Creek. Trout Creek is a small perennial Class I stream with a significant population of redband trout in the upper stream reaches. The lower reach of Trout Creek is intermittent and does not support a permanent population of fish. Redband are a genetically distinct race of trout, and though no longer classified as a sensitive fish species, they still receive special management emphasis. Fish habitat in the perennial portion of Trout Creek is in fair condition. The stream is dominated by riffles and lacks large, deep pools. Fish habitat improvement projects, that address the development of pools and cover, have already been completed. Additional projects are planned.

21. Twin Lakes Basin. Twin Lakes is adjacent to Tamarack Lake, eight miles southwest of Castle Crags State Park. The scenery is outstanding, and the vegetation is diverse. It includes a meadow system, riparian and lakeshore communities, and montane mixed conifer forest on serpentine. Two sensitive plants are found here: thread-leaved penstemon (Penstemon filiformis) and Scott Mountain phacelia (Phacelia dalesiana). Port Orford-cedar is common along the creek that drains the lakes.

22. Wells Creek Falls. Wells Creek Falls is located about one mile southwest of Tedoc Gap and adjacent to the Wells Creek Campground. Wells Creek flows over a massive rock outcrop and falls for nearly 150 feet to a large pool below.

Mt. Shasta - National Forest Scenic Area (Proposed)

Public Issue

There were no public issues which specifically relate to Mt. Shasta.

Several organizations have proposed that Mt. Shasta be designated as a Special Interest Area or National Scenic Area.

The upper slopes of Mt. Shasta have three special land use designations. In 1926, the Secretary of Agriculture designated 29,620 acres as the Mt. Shasta Recreation Area. In 1976, the Secretary of Interior designated 8,000 acres as a National Natural Historic Landmark. In 1984, the U.S. Congress designated 38,000 acres as a Wilderness. These designations focus attention on the upper

Table III-14
Recommended and Potential Special Interest Areas

Area Name	Acres**	MA#	Ranger District	Special Interest Feature
1. * **Bigelow Meadow**	136	10	McCloud	Ecological
2. Big Sand Flat	-	2	McCloud	Botanical (Sensitive Plants)
3. * **Black Butte**	560	3	Mt. Shasta	Geologic
4. Blake Mountain	-	20	Hayfork	Botanical
5. Burnt Lava Flow	-	1	McCloud	Geologic
6. Cable Creek	-	20	Hayfork	Botanical
7. * **China Mountain**	680	5/6	Mt. Shasta	Botanical
8. * **Cory Peak**	280	6	Mt. Shasta	Botanical
9. * **Deadfall Basin**	460	6	Mt. Shasta	Botanical (Sensitive Plants)
10. * **Deep Crater**	333	1	McCloud	Geologic
11. Del Loma Cave	-	15	Big Bar	Geologic
12. Dobkins / Durney Basin	-	5	Mt. Shasta	Botanical
13. Dubakella Mountain	-	19	Hayfork	Botanical
14. * **Giant Crater Lava Tube System**	179	1	McCloud	Geologic
15. * **Grizzly Peak**	220	11	Shasta Lake	Scenic, Botanical
16. Hall City Cave	-	21	Yolla Bolla	Geologic
17. Hirz Mountain	-	8	Shasta Lake	Botanical
18. * **Kangaroo Ridge**	190	6	Mt. Shasta	Botanical
19. * **Little Glass Mountain**	1,440	1	McCloud	Geologic
20. Lower McCloud River Wild Trout Area	-	10	McCloud	Ecological
21. McCloud Falls	-	10	McCloud	Scenic
22. McGinnis Springs/Wagon Camp	-	2	Mt. Shasta	Botanical
23. Mt. Shasta Scenic Area	-	3	McCloud/Mt. Shasta	Scenic
24. * **Natural Bridge**	64	18	Hayfork	Geologic
25. New River	-	14	Big Bar	Botanical
26. * **Paint Pot Crater**	444	1	McCloud	Geologic
27. Papoose Hill	-	1	McCloud	Geologic/Ecological
28. Potem Falls	-	12	Shasta Lake	Scenic
29. Potter Creek Cave	-	8	Shasta Lake	Paleontologic/ Geologic
30. * **Pumice Stone Mountain**	107	1	McCloud	Geologic
31. * **Samwel Cave**	20	8	Shasta Lake	Geologic, Archaeological
32. * **Scott Mountain**	128	6	Weaverville	Botanical
33. * **Spatter Cones**	5	1	McCloud	Geologic, Archaeological
34. * **Tedoc Mountain**	1,060	22	Yolla Bolla	Botanical
35. Tilted Rock Lava Flow	-	1	McCloud	Geologic
36. * **Toad Lake**	650	5	Mt. Shasta	Botanical
37. Tombstone Peak Caves and Fossil Locality	-	9	Mt. Shasta	Geologic

*** Recommended for establishment as Special Interest Areas in Alternative PRF**
**** Acreage figures are not available for the potential SIAs.**

Table III-14 (continued)
Recommended and Potential Special Interest Areas

	Area Name	Acres**	MA#	Ranger District	Special Interest Feature
38.	Trout Creek Redband Trout Area	-	2	McCloud	Ecological
39.	Twin Lakes Basin	-	6	Mt. Shasta	Botanical
40.	Wells Creek Falls	-	22	Yolla Bolla	Scenic
41.	* Western Azalea	25	21	Yolla Bolla	Botanical
	Total	6,981			

* Recommended for establishment as Special Interest Areas in Alternative PRF
** Acreage figures are not available for the potential SIAs.

slopes of Mt. Shasta. The lower slopes of Mt. Shasta also possess qualities that make it worthy of a special recreation or scenic designation.

Current Management Situation

Mt. Shasta dominates the landscape. Mt. Shasta's discovery, exploration and admiration are documented in many historic records and drawings. From Native American legends through early explorer's sightings to today's recreationists, the mountain represents something very unique and special. The mountain continues to be a focal point for Native Americans, mountain worshippers, skiers, sightseers, climbers, photographers and campers. Yearly over 120,000 people travel the Everitt Memorial Highway to the 7,500' elevation on Mt. Shasta.

Facilities include one 9 unit campground, one 10 unit walk-in campground, a scenic vista and interpretive trail, 10 trailheads, and a climber's staging area. The campgrounds, trailheads, and trails have had limited rehabilitation and maintenance over the last 30 years. Much of the management of the Everitt Memorial Highway corridor is on hold pending development of the Mt. Shasta Ski Area.

Mt. Shasta has received national publicity for its volcanic activity. It is an active strato volcano and the second highest mountain in the Cascade Range. Formed by periodic volcanic activity over the last 100,000 years, Mt. Shasta displays many unique geologic features. These include numerous lava flows, mud flows, seven glaciers, three waterfalls and canyons.

Management Opportunities

It is recommended that the Secretary of Agriculture administratively designate 110,000 acres as the Mt. Shasta National Forest Scenic Area. Management efforts would focus on restoring and maintaining the outstanding scenic value of this mountain landscape, while emphasizing quality recreation experiences.

Potential programs, initiatives, and resource management activities would include the following:

1. Designate the Everitt Memorial Highway as the "Mt. Shasta National Scenic Highway". Include two miles of new highway construction to provide direct access off Interstate 5.

2. Develop an International Visitor Complex within one mile of Interstate 5. This Center would provide for interpretation and education about Mt. Shasta's unique historic, cultural, geologic and scenic values.

3. Emphasize "pleasure driving, sightseeing, pleasure walking and picnicking." These are four of the top six activities listed in the 1989 RPA assessment that are expected to exhibit the greatest growth in numbers of recreational trips away from home in the next 50 years. Develop quality trailheads, day hike trails, scenic vistas, picnic sites and interpretive signs.

4. Showcase meadow restoration, landscape management, compatible timber harvest techniques, red fir reforestation, and winter sports opportunities.

19. TIMBER

Public Issues

Four public issues are directly related to timber management. They are:

a. **Should herbicides be used to control vegetation in order to meet timber management objectives?** *(Public Issue #15)*

b. **What should the timber harvest level or allowable sale quantity (ASQ) be?** *(Public Issue #16)*

c. **What silvicultural practices should be used to assure reasonably successful reforestation of harvested lands and to maintain tree species diversity?** *(Public Issue #17)*

d. **What harvest methods, including clearcutting, should be used to meet management objectives?** *(Public Issue #18)*

Discussion of Public Issues

a. **Herbicides/Timber Stand Improvement.** Timber stand improvement (TSI) consists of suppressing competing vegetation (release) and thinning young stands. The benefits of TSI are increased survival and growth of desired trees and reduced susceptibility to insects and disease.

Between 1988 and 1992, an average of about 8,000 plantation acres were released on the Forests per year, and about 1,600 acres were precommercially thinned.

The Annual TSI Needs Report identifies the amount of acreage that has been inventoried and which is in need of TSI treatments. The most recent Needs Report (October 1992) shows about 34,000 acres are in need of release; an additional 22,000 acres need thinning. In addition, an unknown number of acres in need of TSI treatments have not yet been inventoried.

Release and thinning treatments are normally accomplished by manual, mechanical, livestock, or chemical methods. The treatment method selected for any given site depends primarily on effectiveness and costs of the treatment. Other factors, such as other resource concerns and public opinion, also play a part in selection of treatment methods. Precommercial thinning is normally done manually by chainsaw, but some thinning is done mechanically on flat ground.

Until 1984, plantation release on the Forests was normally accomplished by chemical methods, using herbicides. In 1984, a moratorium was imposed on the use of herbicides until an Environmental Impact Statement (EIS) and Risk Analysis could be completed. Since 1984, release treatments have been accomplished by manual or mechanical methods. The EIS and Risk Analysis have been completed and the moratorium on herbicides has been lifted.

Many of the species which compete with desirable, young trees are vigorous sprouters and rapid growers. Experience and studies indicate that non-chemical release methods are often ineffective and/or too costly in terms of meeting timber management objectives. The analysis done as part of the Regional EIS on Vegetation Management for Reforestation indicates that a ban on herbicide use would result in reduced timber yields and increased costs. (See Chapter II, Section E, Direction Common to all Alternatives).

b. **Harvest Level.** The annual programmed harvest level under the Shasta-Trinity's 1975 Timber Management Plan was about 242 million board feet (MMBF) after adjustments were made for the California Wilderness Act. This harvest level was based on a suitable timber land base of about 1,074,000 acres.

The actual volume sold between 1975 and 1992 averaged about 200 MMBF per year (95 MMBF on the Shasta Forest and 105 MMBF on the Trinity Forest). The actual sell volume was less than the programmed harvest level due primarily to budget limitations, poor timber markets during the early 1980's, and certain restrictions on the timber land base (such as herbicides and roadless areas).

The recent listing of the northern spotted owl has further reduced the Forests' timber sale program. The actual volume sold on the Forests between 1990 and 1992 averaged about 90 MMBF per year.

c. **Reforestation.** The National Forest Management Act (NFMA) regulations specify that when trees are cut to achieve timber production objectives, the cuttings will be made in such a way as to assure that the lands can adequately be restocked to minimum Regional standards within five years after final harvest. This standard applies to even-aged and uneven-aged silvicultural systems.

Regeneration of trees is achieved by either natural or artificial methods. Artificial regeneration by planting is the most commonly used method to assure adequate and prompt regeneration. Most of the artificial

regeneration on the Forests has occurred in areas harvested by clearcutting and shelterwood cutting, and non-stocked areas which have resulted from wildfires. Over 130,000 acres have been planted by artificial regeneration. Many of these plantations are less than 20-25 years of age. Between 1984 and 1992 an average of about 9,500 acres was regenerated by planting annually.

Shade intolerant species, such as ponderosa/Jeffrey pine and Douglas-fir, are the most commonly planted species. The more shade tolerant species, such as red and white fir and incense cedar, are planted in smaller amounts with a greater reliance on natural regeneration. Minor amounts of lodgepole pine and sugar pine are also planted on the Forests.

Depending on the species and site conditions, between 400 and 600 seedlings are planted on each acre. The recommended stocking standards are between 200 to 250 trees per acre. This "overplanting" allows for seedling mortality due to poor planting stock, improper planting procedures, animal damage, and/or moisture stress from other competing vegetation.

The seedling survival rate after one growing season has consistently been about 85-90 percent for the pines and 70-75 percent for Douglas-fir. The success of planted seedlings, along with the natural regeneration that occurs, has resulted in a high percentage (95 percent +) of the Forests plantations meeting minimum stocking standards within five years after harvest.

Natural regeneration is not normally practical due primarily to the unreliability of natural seed sources. Past experience with natural regeneration in shelterwood and selection cuttings has resulted in failures. Stands that were not adequately regenerated in a timely manner were understocked. In addition, shade tolerant species and hardwoods occupied the sites, while little or none of the more valuable species, such as pine and Douglas-fir, regenerated.

d. **Clearcutting/Harvest Methods.** Forest stands are managed by one of two silvicultural systems: even-aged and uneven-aged management. Regeneration methods under even-aged systems include clearcutting, green tree retention (regeneration with reserve trees), shelterwood cutting, and seed-tree cutting. Methods under uneven-aged systems include group selection and single-tree selection. These systems, and their application, are described and analyzed in Appendix J.

Based on experience and silvicultural information, even-aged management is the preferred silvicultural system for the commercial forest types found on the Shasta-Trinity National Forests. This is particularly true when timber growth and yield are a primary management objective. Also, using the criteria from the Regional Guide for the Pacific Southwest Region, August 1984, the silvicultural system which is most appropriate for the timber types and the timber management objectives on the Forests is the even-aged system. Uneven-aged management may be appropriate where resources other than timber are emphasized and a continuous forest cover is desired.

Uneven-aged management is not feasible on a sustained basis on slopes over 40 percent, due to high costs and operability problems resulting in extensive damage to residual trees. Uneven-aged management is also infeasible in stands which are severely understocked, over-mature, or infected with dwarf mistletoe or root diseases. Areas managed under the uneven-aged system require that more land be dedicated to roads, landings, skid trails, etc., than lands under even-aged (estimated 20 percent more). This is because of the smaller openings found in uneven-aged management.

The 1975 Timber Management Plan and Environmental Impact Statement (EIS) selected even-aged management as the preferred method for the Plan period (1975 to present). Clearcutting has been the primary method used to regenerate stands under this Plan. Between 1984 and 1990, about 8,700 acres per year, or about 49 percent of the acres harvested, were clearcut. This figure represents about 0.4 percent of the total Forest acres.The average size of the clearcut openings has been about 10 to 12 acres in recent years.

Other even-aged management systems in use have been the seed step and overstory removal step of shelterwood cutting and intermediate commercial thinning. Only a limited amount of true selection cutting has occurred on the Forests under uneven-aged management (less than one percent of the acres harvested). This method has been used primarily in highly sensitive visual or riparian areas where other resource objectives preclude even-aged systems.

Current Management Situation.

Forest Land Description. Of the 2,121,547 acres of National Forest lands on the Shasta-Trinity National Forests, about 76 percent, or 1,629,000 acres, is forested with commercial conifers. Of that amount 1,077,775 acres are classified as tentatively suitable and available for timber production.

Tentatively suitable timber lands occur in four major commercial forest cover types: mixed conifer, Douglas fir, ponderosa pine, and red fir. Lodgepole pine,

knobcone pine, and hardwoods are also found, but they are in limited supply with minor timber yields. About six percent of the tentatively suitable timber land base is occupied by brush and other non-commercial species and is devoid of commercial trees. Digger pine is the predominant non-commercial conifer forest type found on the Forests.

See **Figure III-4** for the general location of the major commercial forest types on the Forests.

Mixed conifer is the most prevalent forest type. Approximately 87 percent of the tentatively suitable timber lands on the Forests fall into this category. Mixed-conifer stands dominate most of the mid-elevation zone on both Forests. These stands contain various mixtures of ponderosa or Jeffrey pine, Douglas-fir, white fir, sugar pine, and incense cedar. Productivity varies greatly, with the average timber site being Dunning Site Class III on the Trinity side and Site II on the Shasta side.

Dunning Site Class

Site Class	Mean Annual Growth (Cubic Feet/Acre)
I	120+
II	85-119
III-IV	50-84
V	20-49
VI	<20

The Douglas-fir type is found only in the South Fork Mountain area of the Trinity Forest. Pure stands of productive Douglas-fir grow there. Only about two percent of the tentatively suitable timber lands on the Forests fall into this type. The average timber site is Dunning Site Class I.

The ponderosa pine type is found only in the Mt. Shasta and eastern McCloud Flats area on the Shasta Forest. This type makes up about one percent of the tentatively suitable timber lands on the Forests. The average timber site is Dunning Class IV.

The red fir type grows at higher elevations above 6,000 feet. About four percent of the tentatively suitable timber lands fall in this category. Most of the red fir found on the Trinity Forest grows within Wildernesses. Red fir grows in pure stands, in a mixture with white fir, or with lodgepole pine. Productivity varies greatly but is generally high. The average timber site is Dunning Class III.

Hardwood types grow on about nine percent (190,000 acres) of the Forests. Nearly four percent of the tentatively suitable timber land is occupied with pure hardwood stands; however, hardwoods are not considered a commercial timber species. The primary commercial value of hardwoods is for firewood and biomass for energy producing wood-burning plants. Hardwoods also provide non-commercial values, such as for soil productivity and wildlife and habitat diversity.

The predominant conifer species on the Forests are Douglas-fir, ponderosa pine, red and white fir, sugar pine, and incense cedar. The predominant hardwood species are black oak and live oak. A breakdown of the primary timber species found on the Forests is shown in **Table III-15.**

The current size and age class distribution of the Forests' commercial conifer timber is not in an even, or regulated, condition. There is a vast amount of land in the small sawtimber class and less in the smaller and larger size classes, as displayed in **Table III-16.**

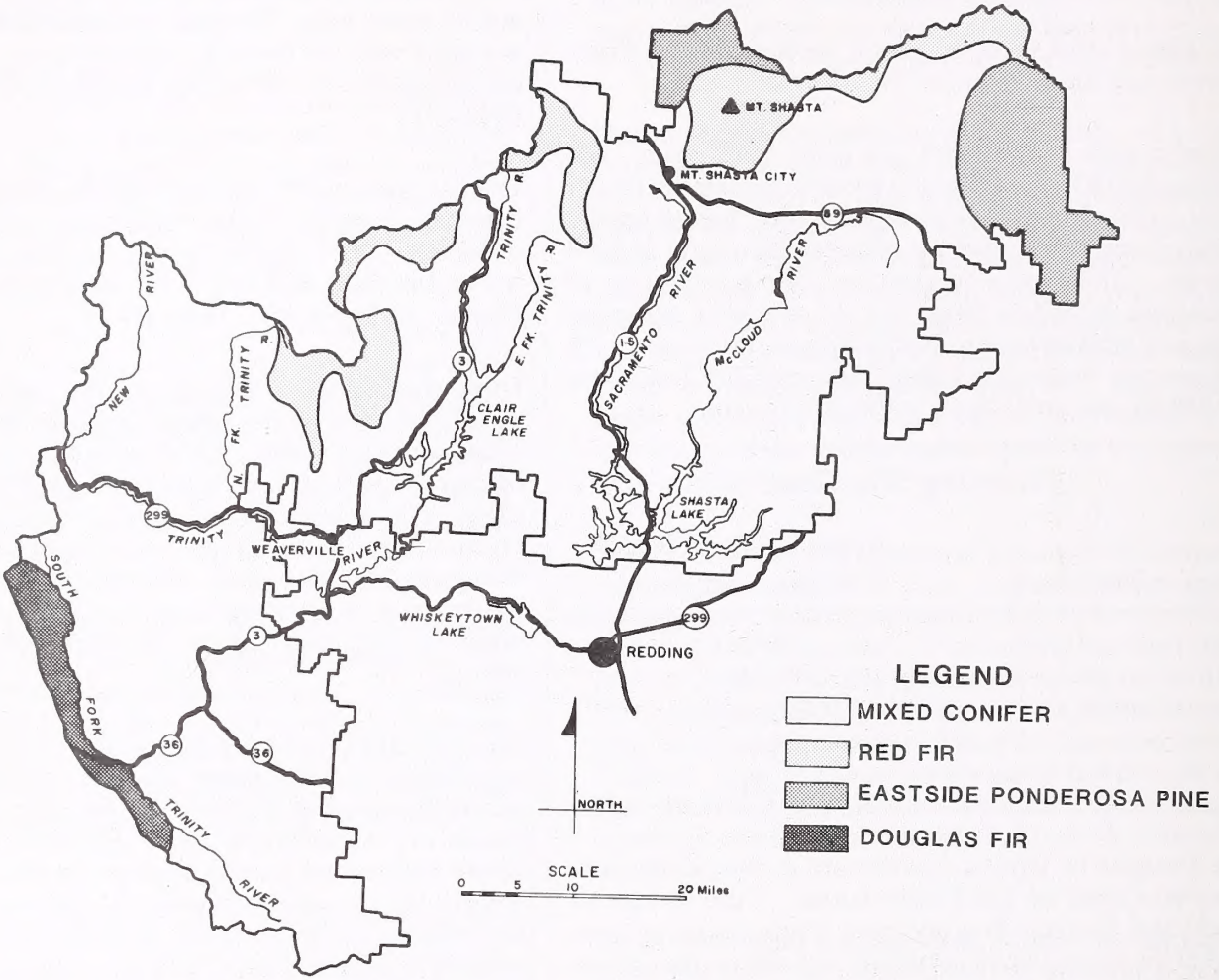
There are over 300,000 acres of understocked stands, or about one-third of the tentatively suitable timber land base, on the Forests. These areas are understocked because of natural events such as wildfires, or because of past management practices relating to partial cutting. These stands are growing at a rate significantly less than their potential. Many acres of these understocked stands are in need of a regeneration cut and reforestation in order to bring them up to full stocking and optimum growth.

Except for the seedling/saplings class, most of the existing stands on the Forests have culminated in mean annual increments of cubic foot growth. In fact, many stands are over-mature and have reached the point where they are not putting on any new growth (mortality is equal to or greater than growth). These stands are not fully utilizing site potential for timber production and are growing at a rate far less than their potential growth rate. In order to maintain or increase harvest levels, these stands should be regenerated and converted to fast-growing, young-growth stands.

Early Logging/Timber Management Plans. Timber harvesting began on the Forests in the early 1900s. Most of this early logging was done by railroad to remove high value pine from the flats of the Shasta Forest. There were no long-term timber management objectives at the time.

The concern for a sustained yield of timber and the need for a timber harvest schedule, based on inventory and growth, prompted the first formal timber management plans in the early 1950s. The latest timber management direction was established in the May 8, 1975, Shasta-Trinity National Forest Timber Management Plan and Final Environmental Impact Statement. Among other things, this Plan set an annual potential timber yield for the Forests based on timber inventory conditions in the 1960s.

Figure III-4
Major Commercial Forest Types



Several of the assumptions on which these potential yield calculations were based have changed or have proven incorrect. Recent changes in multiple-use direction for timber producing lands (such as for spotted owls), as well as reductions in the amount of land suitable and available for timber production (such as for new wildernesses and recent land exchanges), have significantly changed the Forests' timber base.

Suitable Timber Land Base. The National Forest Management Act (NFMA) of 1976 required the Forests to do an assessment of lands which are capable, available, and tentatively suitable for timber production. Based on this assessment, which was completed in 1990, 622,870 acres on the Shasta side and 454,905 on the Trinity side, for a total of 1,077,775 acres, have been identified as tentatively suitable for timber production. Of this amount, 924,230 acres are suitable for all silvicultural systems (including clearcutting); 37,945 acres are suitable for all systems except clearcutting (primarily high elevation red fir); and 115,600 acres are suitable for stand maintenance or salvage only (due to site limitations such as low soil productivity, high rock content, and soils with poor water-holding capacity).

Lands classified as unsuitable for timber (1,051,749 acres) because they are non-productive, non-regenerable, unstable, or unavailable are removed from the timber base, and no timber harvest is planned. Only stand maintenance or salvage for other resource purposes is permitted on unsuitable timber lands.

Timber Supply. The Shasta-Trinity National Forests are among the major timber producing forests in California. The Shasta-Trinity, Klamath, Six Rivers, and Plumas

Table III-15
Percent Species Composition
(based on basal area/acre)

Species	Percent Shasta NF	Percent Trinity NF
Douglas-fir	33	38
Ponderosa Pine	29	12
Jeffrey Pine	nominal	3
Sugar Pine	5	6
Lodgepole Pine	1	nominal
Western White Pine	nominal	1
Knobcone Pine	nominal	nominal
White Fir	6	2
Red Fir	5	1
Incense Cedar	4	14
Black Oak	14	3
Live Oak	1	13
Tanoak	nominal	2
Pacific Madrone	nominal	3
Other Species	2	2
Total	**100**	**100**

Data Source: Forest Timber Inventory - 1980 (updated 1989)

National Forests account for approximately one-half of the potential yield and timber sale volume from the National Forests in the State.

An estimate of the Shasta-Trinity National Forests' timber supply situation resulted from timber inventories completed in 1980 and updated in 1989 to reflect current conditions. According to these inventories, there are about 19.0 billion board feet of standing timber on the Forests on lands classified as tentatively suitable for timber production.

Table III-17 summarizes the current (1989) situation for the timber resources on the Forests, including inventory volumes, suitable acres, and growth for each timber strata.

The Forests supply timber to about 20 local mills. This timber helps satisfy local, regional, and national demands for lumber and other wood products. Nearly all of the Forests' timber is processed in the local impact counties of Shasta (40 percent), Trinity (26 percent), Tehama (16 percent), and Siskiyou (12 percent). The

Table III-16
Timber Size/Age Class Distribution

Size Category	Approximate Diameter Range	Approximate Age Range (years)	Percent of Conifer Land
Seedlings, Saplings	0-5"	0-30	9
Poles	5-11"	30-80	8
Small Sawtimber	11-24"	80-180	69
Medium-Large Sawtimber	>24"	180 +	14
Two-Storied Stands	mixed	mixed	<1

Data Source: Forest Timber Inventory - 1980 (updated 1989)

annual capacity of the mills in the local area is estimated at between 700 and 800 MMBF.

The Shasta-Trinity National Forests have supplied approximately one-fourth of the total timber volume harvested in the local area over the last several years. The average volume harvested between 1975 and 1992 was about 97 MMBF per year on the Shasta Forest and 115 MMBF per year on the Trinity Forest. This volume will decline in the next few years primarily because of the listing of the northern spotted owl.

As of September 30, 1992, the volume under contract on existing timber sales on the Forests was about 80 MMBF. The volume under contract has been steadily declining in recent years.

Over 200 MMBF of merchantable timber outside of Wildernesses was burned and killed during the wildfires of 1987 and 1988. Over 90 percent of this timber has been logged or has been prepared for salvage.

Timber Demand. Demand for timber is relatively high because mill capacity in the local area is about four times the Forests' annual sell volume, leading to highly competitive bidding on most sales. Purchasers of Shasta-Trinity National Forests' timber sales are centered in the Red Bluff-Anderson-Redding areas. In addition, appreciable quantities are processed in the smaller, surrounding communities of Hayfork, Weaverville, Burney, and Yreka. The mills in these smaller communities rely heavily on the Forests' timber, with as much as one-half of the processed timber coming from the Shasta-Trinity. Timber harvest levels have a significant effect on those communities most dependent on the wood products industry.

In recent years, due to high demand, all of the timber offered for sale on the Forests has been sold. Sales typically sell for several times more than the advertised rates. Timber sale receipts normally exceed the cost of preparing and administering sales, regenerating the timber, and building timber haul roads. Even in this healthy timber market, the possibility exists for individual timber sales to be sold below cost; however, below cost timber sales are rare.

Real timber prices have steadily increased over the years, as reflected in the average dollars per thousand board feet (MBF) paid for timber sales on the Forests. These long term price trends reflect the increasing scarcity of timber in relation to demand.

Demand for the major conifer species on the Forests can be reflected in their relative stumpage values. Sugar pine and ponderosa pine are high value species; Douglas-fir and incense cedar are moderate value species; and the true firs, red and white fir, are low value species.

The demand for hardwoods for home heating has risen dramatically, since the cost of electricity has increased. However, there are large quantities of hardwoods on the Forests. The majority of the hardwood is located in inaccessible areas or on steep slopes. Black oak, tanoak, chinquapin, madrone, and live oak are the most common hardwoods available. Hardwoods also provide an important element to the habitats of certain wildlife species. Increased demands for hardwood could create use conflicts in the future.

Management Opportunities

Several opportunities, associated with timber management activities, exist in terms of timber and other resource values.

Timber growth and yield can be enhanced by replacing understocked and poorly-growing stands with fully stocked, thrifty conifer stands. Understocked stands should be a high priority for regeneration in order to capture growth potential and maintain or enhance future yields. This would, in turn, ensure a continued supply of wood fiber from the Forests and help meet consumer demand.

The loss of trees to forest pests can be reduced by maintaining healthy, vigorous stands through timber management activities such as thinning and salvage, and by managing other vegetation which competes with the trees.

Vegetation manipulation, through timber management, can also provide the means to enhance or improve other resource values, such as creating suitable wildlife habitat.

Opportunities also exist to reduce the visual (environmental) effects of timber harvesting, particularly even-aged regeneration cutting such as clearcutting. Some ways in which this could occur would be to: (1) reduce the number of acres clearcut; (2) reduce the size of clearcut openings; and (3) increase the number of standing residual trees left in a clearcut after harvest and site preparation.

Opportunities exist to increase the use of uneven-aged silvicultural systems, such as selection cutting, primarily to meet wildlife and visual objectives. Opportunities also exist to test growth and yield assumptions under uneven-aged management by practicing intensive uneven-aged management in selected areas and monitoring yield results.

Over the past several years, an increasing number of procedural requirements have been placed on the planning and implementation of timber management practices. New laws, Executive Orders, and policies have

been enacted or adopted that have assigned values higher than timber to special or unique resources. Other procedural requirements, growing from a recognition of the environmental effects associated with intensive timber management, have affected the amount of land available for timber production.

The most significant changes that have affected the future production of timber are: management of threatened and endangered (T&E) and sensitive plant and animal habitats; protection of significant cultural resources; management of Wilderness and roadless areas; and the maintenance of natural-appearing areas as seen from heavily-traveled roads or recreation areas. These requirements will be reflected in the current timber inventory and land base in the proposed Forest Plan.

This round of planning allows Forest personnel to balance the opportunities for a sustained yield of timber along with other important forest resource requirements and opportunities using the most recent information and data available.

The 1990 Forest and Rangeland Renewable Resources Planning Act targets (1990 RPA targets) for the Forests' timber resource call for a Total Sale Program Quantity (TSPQ) of 195 MMBF per year. The 1990 targets also call for a 14 percent reduction in the number of acres being clearcut. Opportunities for meeting these targets, and ways to best achieve them, will be examined during this planning process.

Table III-17
Timber Condition Classes, Area, Estimated Volume, and Growth Rates
Shasta-Trinity National Forests

Condition Class		Area Tentatively Suitable (M Acres*)		Average Conifer Volume Per Acre (MBF**)		Estimated Total Volume (MMBF***)		Average Current Annual Growth (CF/AC/YR)		Potential Yields Predicted Average Mean Annual Growth of Replacement Stands (CF/AC/YR)	
Timber Strata****		Shasta	Trinity	Shasta	Trinity	Shasta	Trinity	Shasta	Trinity	Shasta	Trinity
Mixed Conifer	M2G	11.8	23.1	17.1	22.4	201.8	517.4	17	58	79	52
	M2P	9.7	7.8	4.6	8.2	44.6	64.0	11	14	79	52
	M3G	161.7	149.2	29.1	28.9	4,705.5	4,311.9	47	40	79	52
	*****M3P	210.3	107.3	10.7	16.8	2,250.2	1,802.6	30	34	79	52
	M4G	42.6	78.6	29.1	28.9	1,239.7	2,271.5	47	40	79	52
Douglas Fir	D3G	-	1.7	-	35.7	-	60.7	-	68	-	104
	D3P	-	1.2	-	15.1	-	18.1	-	30	-	104
	D4G	-	10.0	-	48.0	-	480.0	-	50	-	104
Ponderosa & Jeffrey Pine	P3P	9.2	-	7.5	-	69.0	-	22	-	52	-
Red Fir	R2N	4.5	-	6.9	-	31.0	-	9	-	83	-
	R3G	20.0	-	33.8	-	676.0	-	38	-	83	-
	*****R3P	10.4	-	9.7	-	100.9	-	17	-	83	-
	R4G	1.3	-	33.8	-	43.9	-	38	-	83	-
Knobcone Pine	KPX	6.0	-	3.6	-	21.6	-	9	-	Unest.	-
Lodgepole Pine	LPX	7.8	-	9.8	-	76.4	-	26	-	37	-
Plantations	PL	74.2	65.2	0	0	0	0	Unest.	Unest.	79	52
Hardwoods	HX	36.6	8.2	Unest.	Unest.	Unest.	Unest.	Unest.	Unest.	Unest.	Unest.
Brush	SX	16.8	2.6	Unest.	Unest.	Unest.	Unest.	0	0	Unest.	Unest.
Total		622.9	454.9	-	-	9,460.6	9,526.2	-	-	-	-

20. VISUAL QUALITY

Public Issue

One public issue relates to visual quality:

How and where should visual quality be protected and enhanced? *(Public issue #19)*

Discussion of Public Issue

Visual effects of management practices have become more apparent in recent years. There is public concern that scenic quality has declined overall and that certain silvicultural practices and road building activities have contributed to this decline. There is also concern that visual quality does not receive adequate emphasis. This is most notable along sensitive travel corridors. Others feel that visual resource practices are too restrictive on management activities, particularly timber harvesting and mining.

Current Management Situation

Several factors help contribute to a better understanding of the visual quality situation: (1) the current visual management policy; (2) the existing visual condition; (3) the trend of the Forests' visual condition; (4) the potential supply of scenic quality; and (5) the public demand for scenic quality.

Visual Management Policy

Views from designated State and Federal highways, identified as being eligible for designation as Scenic Highways, are managed to protect scenic quality. In addition, developed recreation areas and wildernesses are managed to protect scenic values.

About 370 miles of roads on the Forests are managed so that adjacent beauty and attractiveness can be maintained or enhanced. In addition, many miles of streamsides and lakeshores are managed to maintain or enhance beauty and attractiveness. Views from designated scenic byways and wild and scenic rivers are managed to maintain or enhance beauty and attractiveness.

The Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) were designated by Congress "for the public outdoor recreation use... and the conservation of scenic, scientific, historic, and other values..." (Public Law 89-336). The NRA is managed accordingly.

The Mt. Shasta Recreation Area possesses "much scenic beauty which should be conserved and developed for use and enjoyment by the general public for purposes of outdoor recreation ...". It is presently managed for those purposes.

Existing Visual Condition

The lands within the Shasta-Trinity National Forests have been divided into three variety classes: Distinctive (Variety Class A), Common (Variety Class B), and Minimal (Variety Class C). These variety classes are a measure of the scenic attributes of the landscape such as landform, water, and vegetative pattern. Over time, landscapes within the three variety classes undergo physical alteration because of road building, timber harvesting, campground construction, mining, etc.

The term existing visual condition is a measure and classification of the degree of physical alteration. There are six visual condition classes on the Forests. These vary from Class I areas, which are unaltered, to Class VI areas which are physically altered on a large scale. (Refer to the Glossary, Chapter VIII, for a description of each of the six classes.)

Table III-18 shows the existing visual conditions by variety class that are found on the Forests. As shown in the table, the most dominant physical alterations have occurred in the least scenic areas (Common and Minimal Variety Classes) while the least amount of physical alterations has occurred in the most scenic areas (Distinctive Variety Class).

Trend of the Forests' Visual Condition

Inventories indicate there is an historic trend toward more change and a less natural appearing landscape. This trend has been accelerating during the past 35 years. As one means to measure this trend, a visual quality index has been developed for the Forests. **Figure III-5** illustrates the estimated change in the visual quality index over time.

Visual Quality Objectives

The inventoried visual quality objectives (VQOs) are based upon estimates of public concern for scenic quality (sensitivity levels), the scenic quality of the landscape (variety class), and distance of the landscape from the principal viewing area. Acres of inventoried VQOs by variety class are shown in **Table III-19**. VQOs identify how much a management activity can contrast visually

Table III-18
Existing Visual Condition by Variety Class

Visual Condition		Variety Class		National Forests (M Acres*)
I	Untouched	A	Distinctive	206.5
		B	Common	673.9
		C	Minimal	28.7
II	Unnoticed	A	Distinctive	33.4
		B	Common	750.9
		C	Minimal	222.3
III	Minor Disturbance	A	Distinctive	4.9
		B	Common	93.7
		C	Minimal	26.8
IV	Disturbed	A	Distinctive	0.4
		B	Common	33.6
		C	Minimal	27.1
V	Major Disturbance	A	Distinctive	0.0
		B	Common	6.5
		C	Minimal	12.8
VI	Drastic Disturbance	A	Distinctive	0.0
		B	Common	0.0
		C	Minimal	0.0
TOTAL				**2,121.5**

Table III-19
Inventoried Visual Quality Objectives (VQOs) by Variety Class

	Variety Class A	Variety Class B	Variety Class C	Total (M Acres*)	Percent
Inventoried VQO					
Preservation	143.2	354.9	0.6	498.7	23.5
Retention	75.0	100.5	0.0	175.5	8.3
Partial Retention	36.4	432.9	121.3	590.6	27.8
Modification	0.0	493.4	104.2	597.6	28.2
Maximum Modification	0.0	167.0	92.1	259.1	12.2
TOTAL	**254.6**	**1,548.7**	**318.2**	**2,121.5**	**100.0**

* M Acres = thousand acres

with the character of the landscape. **Figure III-6** illustrates an example of each VQO.

Management Opportunities

Supply of Scenic Quality

New management techniques are being adopted that will modify the impacts affecting the scenic resource. Smaller openings, as in uneven-aged selection cutting, will normally meet a higher visual quality standard than larger openings.

Many opportunities exist to protect and enhance the visual quality on the Forests. There are ways to support the tourism industry by managing the scenic setting along travel routes and near major tourist destinations. Similarly, there are opportunities to manage the scenic setting near important recreational features and high use areas. In some instances, scenic settings could be enhanced by creating vistas or managing vegetation for the visual characteristics recreationists find most appealing. Finally, there are opportunities to manage additional areas, to maintain or enhance the present visual qualities, and to improve access on and around Mt. Shasta.

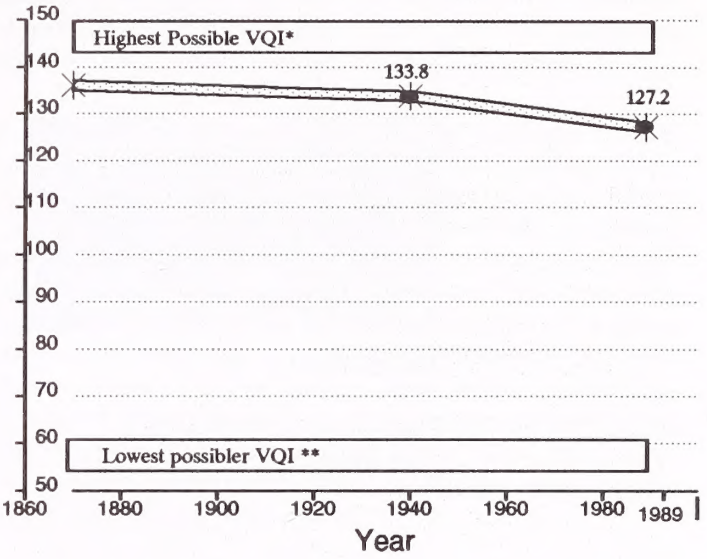
There are also opportunities to lessen the visual effects of timber harvesting activities through the location and design of harvest units. Smaller openings, as in uneven-aged selection cutting, will normally meet a higher visual quality standard than larger openings.

Public Demand for Scenic Quality

Indicators of the demand for visual quality are expressed in the following ways: (1) the desire of more Forest visitors to seek pleasant visual settings for their recreation pursuits; (2) the increasing desire of urban minorities and low-income residents to travel and sightsee in scenic areas; (3) the increasing concern for scenic resources; (4) the increasing number of laws designating management areas where visual quality and aesthetics are primary considerations; and (5) the report by the President's Commission on the American Outdoors which emphasizes the value and importance of scenic quality.

VQOs may deviate from the inventoried VQOs depending on the management objectives and direction for the land. These adopted VQOs dictate the level of visual quality to which the landscape will actually be managed. Under the current management direction, no more than seven percent of the net acres on the Forests would be managed under a maximum modification VQO.

Figure III-5
Trends in Visual Condition
Visual Quality Index (VQI)



* Highest possible VQI equals 149.9 This is the maximum potential.

** Lowest possible VQI equals 58.9. This is the lower legal limit.

Figure III-6
Visual Quality Objectives (VQOs)



Preservation P

Only ecological changes permitted.



Retention R

Management activities are not visually evident.



Partial Retention PR

Management activities remain visually subordinate.



Modification M

Management activities in foreground and middleground are dominant, but appear natural.



Maximum Modification MM

Management activities are dominant, but appear natural when seen as background.



Unacceptable Modification UM

Activities that contrast excessively in form, line, color or texture from the characteristic landscape do not meet visual quality objectives.

21. WATER

WATER QUALITY

Public Issues

One major public issue focuses on water quality:

How should watersheds be managed to maintain or enhance water quality and fisheries? *(Public Issue #6)*

One other issue relates to water:

How wide should riparian management zones (RMZs) be and what management activities should be allowed within them? *(Public Issue # 13)*

Discussion of Public Issues

Water Quality Maintenance and Enhancement. The water on the Shasta-Trinity National Forests is probably its most valuable, widely used, renewable natural resource. Water produced from the Forests' watersheds is used throughout the State for power generation, irrigation, domestic consumption, and many other beneficial uses. The varied users of the Forests' water require a consistently high level of water quality. The water resource is also used for sustaining a variety of fish, wildlife, and other instream water uses.

Forest management activities have the potential to affect water quality, and, subsequently, to affect the utility of the many beneficial uses of the water produced. Management activities, including road building in steep, rugged terrain, have long been recognized as sources of non-point water quality pollution. Non-point pollution is controlled by containing the pollutant at its source, thereby precluding delivery to surface water and protecting water quality. The means of watershed management to meet the end of water quality maintenance or enhancement is an issue that concerns all recipients of the Forests' water.

Related Issue

Riparian Management Zone Width. Refer to the discussion of this issue in the Riparian Area section.

Current Management Situation

Water Quality Management. The quality of water that is produced as runoff from the Shasta-Trinity National Forests is measured against water quality objectives established by the Clean Water Act and the River Basin Plan objectives established by the State of California.

Water quality on the Shasta-Trinity National Forests varies with water source, flow, sources of pollution, and timing of water yield. Parameters of water quality, which pertain to the forest environment, include sediment, temperature, pH, dissolved solids, heavy metals, chemicals (pesticides and fertilizers), and bacteria and protozoans from human and animal waste. All of these parameters, with the exception of pesticides and fertilizers, occur at some natural level in the aquatic environment. The natural level of these parameters in the water constitute the background or natural water quality. This natural water quality also varies with water source, flow, and timing of water yield.

Water quality is regulated by the Clean Water Act, under the direction of the Environmental Protection Agency (EPA) and the California State Water Resources Control Board. Local regulation is provided in the Trinity River Basin by the North Coast Regional Board, and in the Sacramento River Basin by the Central Valley Regional Board. Water Quality Control Plans for both Regions contain Water Quality Objectives (standards), Beneficial Uses, and a "Statement of Policy With Respect to Maintaining High Quality Waters in California". These Plans regulate water quality of the waters of the Shasta-Trinity National Forests just as they regulate all other waters of the respective river basins.

Water quality is maintained and improved through the application of state certified and EPA approved Best Management Practices (BMPs) for controlling non-point sources of pollution to surface water. Methods and techniques for applying the appropriate BMPs are identified during on-site investigation of forest projects that have the potential to degrade surface water quality.

BMP implementation is monitored during and after project execution. Effectiveness monitoring is also conducted following project completion to ensure that the BMPs meet their stated objective to protect water quality. Implementation and effectiveness reviews are conducted in cooperation with the Central Valley and North Coast Regional Water Quality Control Boards. If monitoring indicates that water quality standards are not being met, or have the potential of not being met, then corrective action is taken. Corrective action considers the cause of failure or threatened failure of BMP objectives. The cause could be due to the inadequacy of the BMP itself, a failure of the implementation process, or an inadequacy of the standard being measured. More detailed discussions of BMPs and the implementation

process are presented in Appendix E of the proposed Forest Plan.

Protection of floodplains and wetlands, from management activities involving dredging and filling, are regulated through the permit system of the Clean Water Act, Section 404, administered by the U.S. Army Corps of Engineers. There are exemptions and blanket authorizations within the law that afford "general permits" for most forest management activities. 40 CFR 232.3, Subsection c, identifies six activities exempt from permit requirements. Among them are: normal silvicultural activities, construction and maintenance of forest roads, maintenance and emergency reconstruction of dams, bridges and abutments/approaches. Some examples of Forest activities that could be affected by the permit system include: road or campsite development within floodplains or wetlands that requires fill material placement, installing or removing boat ramps, or fish habitat enhancement projects such as gabion placement.

Impacts to wetlands are minimized to the extent appropriate and practicable with the use of BMPs. Where unavoidable adverse impacts remain, compensatory mitigation measures are undertaken in accordance with the guidelines provided in the Management Agency Agreement between the EPA and the Army Corps of Engineers. These determinations are made on a case-by-case basis at the project planning level.

The water quality of streams within watersheds disturbed by forest management activities meets quality objectives during the dry part of the year when erosion and sedimentation processes are curtailed. Exceptions include water draining from old mining sites, direct discharges of pollutants, or areas where direct streamside canopy has been removed. Further degradation of water quality can occur in the rainy season within disturbed watersheds. Most National Forest management activities have either no affect or only a short term affect on water quality. Unsurfaced roads, especially those that are poorly maintained, cause long-term water quality degradation.

Watershed Condition. Watershed condition is a description of the health of a watershed, or portion thereof, in terms of the factors which affect hydrologic function and soil productivity. Hydrologic function controls the manner in which water travels through the watershed as surface and groundwater resources. Forest management activities influence the natural hydrologic function of watersheds in a number of ways. Examples of these influences include: changes in peak stream flows, erosion (sheet, rill and mass wasting), soil compaction, and vegetation removal. Additionally, cumulative effects which include the relative timing, location, type and level of management activities are significant because they can influence the magnitude of any of the above factors.

Watershed condition can be classified by evaluating the cumulative watershed impacts. This method calculates soil disturbance and compaction from roading and timber harvest activities in equivalent road acres (ERAs). A watershed's sensitivity is evaluated and classified and a threshold of concern (TOC) value is assigned. This value is expressed in percent ERA, with lower sensitivity watersheds having a higher TOC than the highly sensitive watersheds. The TOC value is meant to indicate a point where, if approached or exceeded, the risk of watershed degradation is considered significant and mitigation measures should be implemented to lessen the hazard. (See Appendix H).

Watershed condition classes are defined in terms of the level of ERAs for individual watersheds with respect to their TOC. **Table III-19** summarizes the typical characteristics of the three watershed condition classes.

Table III-19
Watershed Condition Classes

	CLASSES		
Characteristics	**1**	**2**	**3**
ERA Levels as a Percent of TOC	<40	40 - 80	>80
Stream Channel Conditions	Good to Excellent	Fair to Good	Fair to Poor
Soil Productivity	Maintained at optimum levels	Maintained at lower levels than Class 1	Maintained at lower levels than Classes 1 and 2
Water Quality	Exceeds objectives	Meets objectives	Meets or is below objectives
Potential for Degraded Water Quality or Soil Productivity	Low	Low to moderate	Moderate to high

Sixty-one watersheds have been identified within the Forests (refer to map, **Figure III-7**). These watersheds range from 11 to 410 square miles in size. An inventory of the existing watershed condition of these watersheds indicates that most are presently Class 1 and Class 2 (**Tables H-1** and **H-2** in Appendix H). However, seven watersheds have relatively high disturbance levels which cause them to be a Class 3. These watersheds are the East Fork of the South Fork Trinity River, Rattlesnake Creek, Butter Creek, Plummer Creek, Gulch, Hyampom and Upper Hayfork Creek. Cumulative effects have occurred within subwatersheds of these watersheds, and there is a significant risk of initiating cumulative effects within the main channels which drain these watersheds.

In addition, some watersheds were extensively affected by the 1987 and 1988 wildfires. Although these watersheds are in condition Class 2, they could undergo cumulative watershed effects in some of their subwatersheds (e.g., Salt Creek and the Upper South Fork Trinity River watershed).

Management Opportunities

All areas of declining watershed condition would be treated to regain natural watershed stability. Restoration would be conducted at a rate commensurate with RPA targets for watershed improvement. Watershed improvement on the Shasta-Trinity National Forests would be accomplished through the implementation of a Forest Watershed Improvement Program to identify, assess, and fund improvement of degraded watersheds.

The 1990 RPA targets for watershed improvement on the Forests are to restore 700 acres per year during the first decade; 710 acres per year during the second decade; and 450 acres per year during the third decade. Implementing the target rate on the watershed improvement needs identified to date would result in complete watershed restoration sometime during the second decade. A more extensive/complete inventory is needed, however, to identify all areas within deteriorated watersheds that are in need of improvement.

The 1984 Regional Guides include direction for treating all lands that are in a declining watershed condition by the year 2000. Because of the constraints involved and the magnitude of the areas needing improvement (some 11,000 acres), this direction would probably not be met. The intent, however, is to treat areas of declining watershed condition as rapidly as possible.

BMPs are used for the protection of water quality as described in the most current version of "Water Quality Management for National Forest System Lands in California." (This document is available at any Pacific Southwest Region National Forest Office). In addition, a Forest Supplement to the BMP Handbook describes additional measures which can be prescribed to protect water quality. These BMPs prevent land-disturbing activities from polluting water from non-point sources. Use of these BMPs would also insure the protection or enhancement of riparian areas.

A new BMP monitoring handbook has been developed and is being implemented throughout the National Forests in the Pacific Southwest Region (Region 5). The handbook provides for a uniform procedure for monitoring BMP implementation and effectiveness. The procedure includes BMP activity reviews, monitoring of specific BMP applications, and monitoring of water quality and beneficial uses downstream from the BMP applications. Monitoring efforts and results would continue to be shared with the Central Valley and North Coast Regional Water Quality Control Boards.

The degradation of watershed condition and cumulative watershed impacts would remain a concern in the future. However, they could be minimized through the application of cumulative impact assessments on all projects occurring on National Forest lands. Through the dispersement of management activities, both in time and space, the identification and proper management of sensitive lands and the proper application of BMPs, watershed condition can be maintained and cumulative impacts can be prevented from occurring.

WATER YIELD

Public Issues

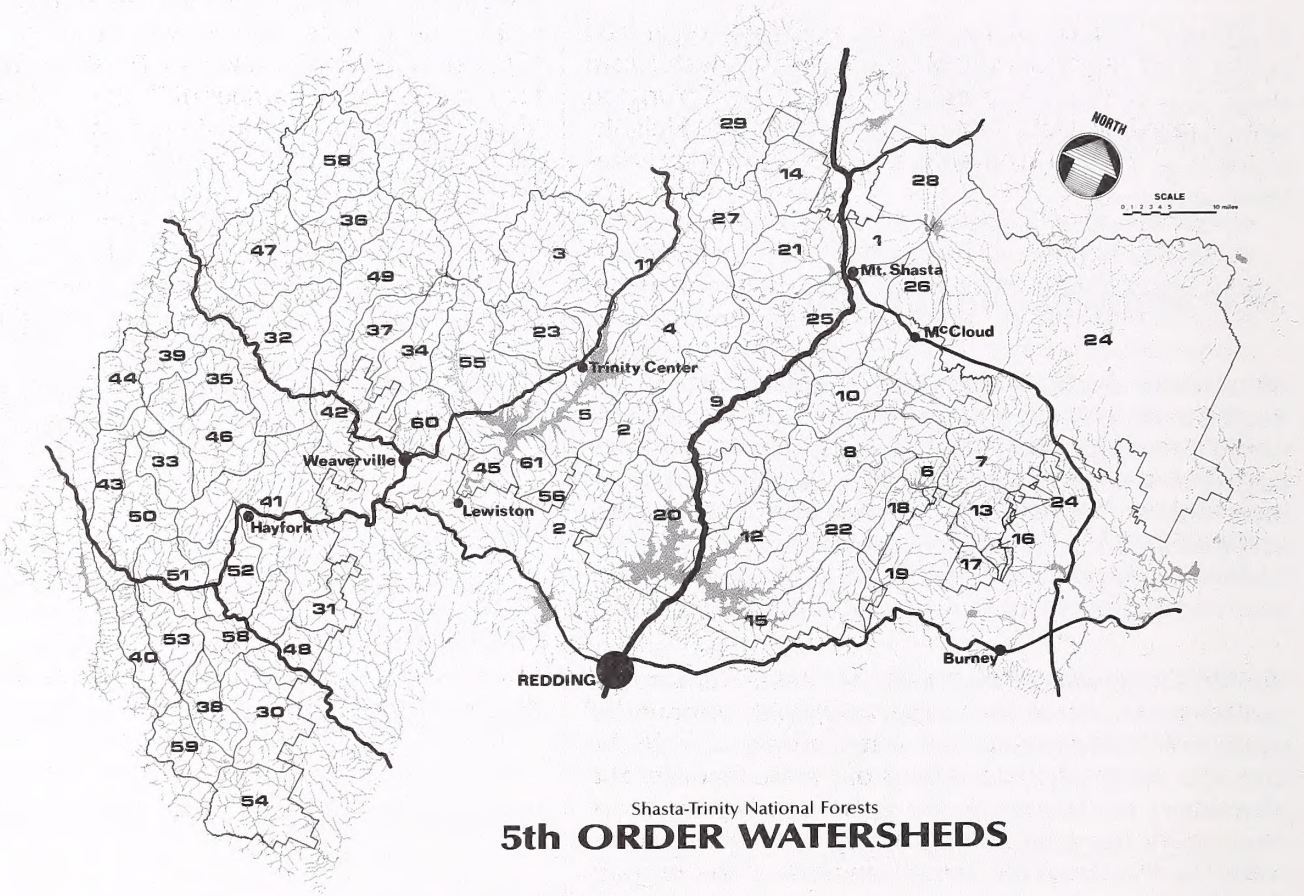
No public issues focus specifically on water yield.

Current Management Situation

The Shasta-Trinity National Forests are within the Upper Sacramento and Trinity River Basins. The basins produce an average annual runoff of 6,972,000 acre-feet of water. Of this total, about 5,450,000 acre-feet of water flows from National Forest lands. (See Appendix H for a display of average water yield by National Forest watershed).

Beneficial Uses. Of the 5.45 million acre-feet of water yielded from Shasta-Trinity National Forests' watersheds annually, almost all is used for human benefit in some manner. Water is extensively used both for consumptive and nonconsumptive uses. Beneficial uses derived from water flowing from National Forest land occur within the forest environment as well as downstream many miles from its source. The Water Quality Control Plans for the North Coast and Central Valley Regions list potential as well as existing beneficial uses for the waters of the major tributaries on the Forests.

Figure III-7
5th-Order Watersheds



Shasta and Clair Engle (Trinity) Lakes provide water for fish habitat, many forms of recreation, hydroelectric power production, and extensive downstream agricultural irrigation. Major sources of hydroelectric power on the Shasta-Trinity National Forests also come from the Pit River. Lake Britton, Lake McCloud, and Iron Canyon Reservoir are all diversions for hydroelectric power. About 60 to 70 small-scale hydropower projects are being developed on smaller water sources.

About 1,900 miles of fishable streams, 131 natural lakes, and 11 manmade reservoirs, within the Forest boundaries, provide a variety of recreational opportunities.

Nine communities within the Forests have organized water supply agencies that obtain community water from surface sources. They are: Big Bar, Castella, Covington Mill, Craigview, Del Loma, Hayfork, Lakeshore Heights, Trinity Center, and Weaverville. Shasta and Trinity Lakes also provide domestic water to several communities and/or resorts: Jones Valley, Silverthorn Resort, Bridge Bay Resort, Mountain Gate, Shasta Dam Public Utilities District, and Fairview Marina. There is no formal agreement with these users regarding the management of the appropriate watersheds. The quality of the water for this domestic use meets State objectives. In addition to community systems, many individual domestic water systems are scattered throughout the Forests. Current management direction is to protect water quality for domestic use, and this has been effective in precluding unacceptable impacts.

Demand for consumptive water is expected to increase in proportion to the population growth and the distribution of this growth throughout the State. Demand for instream uses and uses associated with impounded water will also increase. The water produced from the Shasta-Trinity National Forests is of sufficient quality and quantity to meet demands during the next 10 years. More information about consumptive and nonconsumptive water needs is required in order to develop future plans for meeting these needs.

What role the Shasta-Trinity National Forests will have in meeting future water needs for the State of California is unknown. The Forest Service would cooperate fully with the State Water Resources Control Board in its efforts to manage the water resource and protect beneficial uses.

Forest personnel have identified 133 future water use needs which would require an additional 137 acre-feet of water annually. These needs are related to management activities, such as future recreation developments and range improvements, where water diversion and consumptive use is required.

Water Yield Increases. The opportunity to increase water yields through vegetative management is limited. Estimates of increases of runoff, through extensive vegetation conversion, indicate that a two percent increase in runoff could be achieved. This estimate was based on a long-term conversion of forest land to vegetation with a lower transpiration rate, such as the conversion of brushland to grassland.

The opportunity to manage the Forests' snowpack to control water yield timing is extremely limited as well. The amount of precipitation incorporated into season-long snowpacks represents only a tiny portion of the total annual precipitation and subsequent runoff.

Water Rights. The Shasta-Trinity National Forests hold 43 reservation principal water rights and 83 appropriative water rights. These rights cover uses from domestic supplies for campgrounds to livestock watering. The Forests also hold a number of "Statement of Water Use" files, primarily for dust abatement on roads and for fire protection. These uses are transitory, sporatic, and temporary depending on the immediate needs. These uses have a lower priority than filed water rights and instream beneficial uses. There are records of over 200 water rights held by private interests within the Forests' boundaries, but the records do not include riparian rights users.

Future National Forest water needs are limited. Most of the water needs would be met by drilling wells to extract ground water. All future needs would be met pursuant to State law.

Management Opportunities

Management opportunities for the immediate future are described under "Water Quality".

22. WILD AND SCENIC RIVERS

Public Issue

One public issue emerged relating to Wild and Scenic Rivers. That issue is:

What river segments should be recommended for inclusion in the Federal Wild and Scenic Rivers System? *(Public Issue #20)*

Discussion of Public Issue

Portions of the North Fork, South Fork, the mainstem Trinity River and the New River were added to the National Wild and Scenic Rivers System in 1981. Several other rivers and streams on the Forests have the potential for Wild and Scenic designation. The effects that designation would have on private land use concerns some private landowners, especially those along the McCloud River.

Current Management Situation

In 1968, Congress established the National Wild and Scenic Rivers System and encouraged states and local governments to participate in the program. In 1972, the State established a California System under the California Wild and Scenic Rivers Act (Behr Bill). In 1976, the Forest Service and the California Department of Fish and Game (DFG) entered into a Memorandum of Understanding on cooperative relationships in handling Wild and Scenic River matters for both the National and State systems. This agreement included cooperation in carrying out studies and in preparing management plans.

The Wild and Scenic Rivers Act precludes or substantially limits the construction of dams and other water resources projects which might affect the free-flowing nature of a river.

Designation does not open private lands to public access. Landowners can continue to post their property. Developed access points and recreation user facilities usually help reduce the trespass and impact on both private and public lands.

The Federal government would consider acquiring private lands, if necessary, to protect the values of the river corridor or to provide public access. Acquisition may be by purchase, exchange, or donation, and may be for fee title to all or part of the land, or for easements. In almost all cases, this is accomplished on a willing seller - willing buyer basis.

With a scenic easement the landowner maintains ownership, but agrees to limit the type of use or development that can occur. When an easement is acquired, the landowner retains title to the land. The landowner also retains the right to sell it, rent it, leave it to heirs, or restrict public access. Scenic easements not only protect the river values, but they can also act to protect private properties from adverse development on adjacent private lands.

Federal agencies use condemnation only as a last resort to prevent land use or developments from degrading the outstanding values of the river corridor.

Condemnation of lands is a rare occurrence. There are 100,000 acres of private land within the corridors of the rivers that the U.S. Forest Service manages in California, Oregon, and Washington. These lands have never been acquired through fee title condemnation.

The Wild and Scenic Rivers Act places greater restrictions on the use of condemnation than exists for other areas of the National Forests, National Parks, and other Federal areas. For example, in the National Forests or National Parks, condemnation is available to acquire fee title to any private lands needed for public purposes. This is not true for private lands within Wild and Scenic River boundaries because the Act includes specific restrictions on the use of condemnation. Fee title condemnation is prohibited if more than 50 percent of the corridor land is publicly owned. Most rivers considered for designation are more than 50 percent publicly owned.

The effect of designation on road construction, timber harvesting, and mining varies by whether the river is classified as wild, scenic, or recreational. The types of classification are defined as follows:

--WILD. Those rivers or sections of rivers that are free of impoundments, with watersheds or shorelines essentially primitive, generally inaccessible except by trail, and with unpolluted waters. These represent vestiges of primitive America. Most of these wild river segments are located on public lands.

--SCENIC. Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

--RECREATIONAL. Those rivers or sections of rivers that are readily accessible by road or railroads, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

On Wild segments no roads or other provisions for over land motorized travel would be permitted within one-quarter mile of the river bank. However, one or more inconspicuous roads leading to the river area, for the purpose of providing access, may be permitted. Also, unobtrusive trail bridges could be allowed. The cutting of trees would not be permitted except when needed for a primitive recreation experience or to protect the environment. New mining claims would be prohibited within one-quarter mile of the river. Existing mineral activity must be conducted in a manner that minimizes sedimentation and visual impairment and protects Wild and Scenic River values.

On Scenic segments roads may occasionally bridge the river area. Short stretches of conspicuous or longer stretches of inconspicuous and well-screened roads could be allowed. Consideration would be given to the type of use for which roads are constructed and the type of use that would occur in the river area. A wide range of silvicultural practices could be allowed provided that such practices are carried on in a way that there is no substantial adverse effect on the river and its immediate environment. New mining claims could be allowed and existing operations would be allowed to continue. However, mineral activity must be conducted in a manner that minimizes sedimentation and visual impairment and protects Wild and Scenic River values.

On Recreational segments paralleling roads could be constructed on one or both river banks. There could be several bridge crossings and numerous river access points. Timber harvesting would be allowed. However, some restrictions could apply to immediate river environments to preserve scenic and fish and wildlife values. New mining claims could be allowed and existing operations would be allowed to continue. Mineral activity must be conducted in a manner that minimizes sedimentation and visual impairment and protects Wild and Scenic River values. Refer to Appendix E for a detailed discussion of wild and scenic rivers.

Current Supply. In July, 1980, the Governor of California petitioned the Secretary of Interior to include certain segments of the previously designated California Wild and Scenic Rivers System as part of the National System. In January, 1981, approximately 106 miles of the Trinity River system on National Forest lands were designated as part of the Wild and Scenic Rivers System within the Shasta-Trinity National Forests. The designated Wild and Scenic Rivers are shown in **Table III-20.**

Wild and Scenic River Demand. Public demand for existing Wild and Scenic Rivers, as measured through current recreation use, is low to moderate. Projected demand for free-flowing rivers, as measured through growing public interest, is expected to increase significantly in the next five decades. As more dams and diversions are constructed in the Western States, the availability of Wild and Scenic Rivers will decrease. Therefore, it is likely that the desire for additional river designations will continue as long as the related concerns of water quality maintenance, fishing habitat protection, and scenic protection remain in the forefront.

Management Opportunities

In 1982, the Department of Interior completed an inventory and screening of potential rivers and river segments. A total of 134.6 miles of additional rivers within the Forests' planning area were identified under the National Rivers Inventory. Public comments on the Shasta-Trinity National Forests' Draft Environmental Impact Statement (Draft EIS), issued in August 1986, recommended that Squaw Valley Creek also be considered as a potential river.

Field analysis indicates that 10.5 miles of Squaw Valley Creek are eligible for designation. Segments of the public also recommended Canyon Creek and Hayfork Creek for designation. While these streams were not listed on the Nationwide Rivers Inventory, they total about 21.5 miles and 14.0 miles, respectively, and have been determined to be eligible for designation. The public has also requested evaluation of Beegum Creek and the upper reaches of the Sacramento River (above Box Canyon Dam) for eligibility. These evaluations have not been made but will be done during the first year of Plan implementation.

Forest personnel have made a preliminary administrative recommendation that will receive further review and possible modification by the Chief of the Forest Service, Secretary of Agriculture, and the President of the United States. The Congress reserves the right to designate rivers to the National Wild and Scenic Rivers System.

A Coordinated Resource Management Plan (CRMP) has been adopted for long term management of the Lower and Upper McCloud River (See Appendix N of the proposed Forest Plan). This agreement is between private landowners, the Forest Service, Pacific Gas & Electric, Nature Conservancy, CalTrout, and the DFG. This plan will effectively maintain the outstandingly remarkable values of this potential wild and scenic river. If, for any reason, the terms of the CRMP are not followed and the wild and scenic river eligibility is threatened, the Forest Service will recommend these segments for Federal Wild and Scenic designation.

A Wild and Scenic River Plan has been completed for the South Fork of the Trinity Wild and Scenic River System. Plans are still needed for New River, North Fork Trinity River, and the Trinity River.

Future issues relating to riparian resources will be addressed through implementation of management prescriptions and Forestwide standards and guidelines

which deal with water quality, fisheries habitat, and scenic resource management. Additional formal designations, under a National Wild and Scenic Rivers System, may be required to more fully address these concerns and to bring into the System more diverse examples of unrepresented ecosystems and physiographic provinces. Close coordination with responsible State agencies will be needed.

Table III-20
Current and Potential
Wild and Scenic Rivers (Miles)

River Segment	Currently Designated: Wild NFS	Scenic NFS	Rec. NFS	Total NFS	Total All*	Potential: NFS Only	Potential All*
Beegum Creek Main Fork	-	-	-	-	-	10.0	10.0
Beegum Creek South Fork	-	-	-	-	-	7.0	7.0
Canyon Creek	-	-	-	-	-	17.5	21.5
Hayfork Creek	-	-	-	-	-	11.5	14.0
McCloud River (above dam)	-	-	-	-	-	14.7	24.3
McCloud River (below dam)	-	-	-	-	-	6.1	23.3
New River	7.3	5.0	8.7	21.0	21.0	-	-
Sacramento River	-	-	-	-	-	6.1	37.3
North Fork	-	-	-	-	-	6.0	6.0
Middle Fork	-	-	-	-	-	5.4	5.4
South Fork	-	-	-	-	-	10.2	10.4
Trinity River (main stem)	0.0	5.3	27.9	33.2	111.0	-	-
No. Fork Trinity (lower section)	12.7	0.0	2.3	15.0	15.0	-	-
No. Fork Trinity (upper section)	-	-	-	-	-	11.7	11.7
So. Fork Trinity (lower section)**	19.3	11.8	6.1	37.2	53.0	-	-
So. Fork Trinity (upper section)	-	-	-	-	-	24.8	26.3
Squaw Valley Creek	-	-	-	-	-	10.0	10.5
Virgin Creek	-	-	-	-	-	11.7	11.7
Total	39.3	22.1	45.0	106.4	200.0	152.7	219.4

* Includes National Forest and private lands.

** Number per approved South Fork Environmental Impact Statement (for information only)

23. WILDERNESS AND ROADLESS AREAS

Public Issue

One public issue relates to Wilderness and Roadless areas. That issue is:

How should the Forests' roadless areas be managed, including the Mt. Eddy Further Planning Area? *(Public Issue #21)*

Discussion of Public Issue

Approximately 498,776 acres, or 24 percent of the Shasta-Trinity National Forests, are Congressionally designated as Wilderness. These lands are within the Castle Crags, Chanchelulla, Mt. Shasta, Trinity Alps, and Yolla Bolly-Middle Eel Wildernesses. One roadless area, Mt. Eddy, was designated for further planning and is evaluated for wilderness classification as a part of the current planning process.

The 1984 California Wilderness Act stated that those roadless areas not designated as either wilderness or further planning be managed for multiple use purposes and that they be reviewed again for wilderness when the Forest Plan is revised. Most of the roadless areas are designated as habitat conservation areas for spotted owls (refer to the discussion in the Wildlife Section).

Current Management Situation

The Wilderness Act of 1964 established a National Wilderness Preservation System to be composed of Federally owned areas designated by Congress as "wilderness." Under the Act, wilderness is defined as "an area where the earth and its community of life are untrammeled by man - where man himself is a visitor who does not remain." It is further defined as "a unit of undeveloped Federal land that retains its primeval character without permanent improvements on human habitation, which is protected and managed to preserve its natural conditions."

Supply. The 1964 Wilderness Act designated the Yolla-Bolly-Middle Eel Wilderness, 36,805 acres of which are located on the Shasta-Trinity National Forests.

In the late 1970s, 48 roadless areas were identified during the roadless area review and evaluation process (RARE II) as potential new wildernesses. A roadless area is an area of 5,000 acres or larger that is substantially undeveloped and natural. The study of these areas culminated with the passage of the California Wilderness Act (PL 98-425) in 1984.

The 1984 Act established the Castle Crags, Chanchelulla, Mt. Shasta, and Trinity Alps Wildernesses totalling 461,971 acres. In addition, the Act placed the Mt. Eddy Roadless Area, containing about 7,720 acres, in a further planning category and released 29 other roadless areas to be managed for multiple-uses other than wilderness during the Plan period (10 - 15 years).

EXISTING WILDERNESSES (see Figure III-8)

Castle Crags

This wilderness, located on the Mt. Shasta Ranger District, lies southwest of Dunsmuir just off Interstate 5. It contains 10,483 acres, and elevations range from 2,300 to 7,200 feet. It shares its southeast boundary with Castle Crags State Park. This wilderness is characterized by outstanding and spectacular sheer granite cliffs and spires along an east-west ridge. Many small lakes and streams are found in the area. Campanula shetleri, a sensitive plant, is found in three separate microsites here. The area is bisected in an east-west direction by the Pacific Crest National Recreation Trail (PCT). The area is used primarily by hikers and backpackers.

Chanchelulla

The Chanchelulla Wilderness lies in rural Trinity County about 10 miles southeast of the community of Hayfork. The area is within the Hayfork and Yolla Bolla Ranger Districts. With an elevation of 3,200 to 6,400 feet, topography within its 7,800 acres is moderate to steep. The natural low flow of local streams offer limited fishing opportunities. The summit of Chanchelulla Peak has religious significance for Native Americans (Wintu Indians).

Mt. Shasta

The Mt. Shasta Wilderness has 38,560 acres of contrasting topography and is managed for year-long recreation use. It lies within the McCloud and Mt. Shasta Ranger Districts. The wilderness surrounds Mt. Shasta from about the 6,000 to 8,000-foot level to its peak (14,162 feet). In addition to its wilderness designation, the mountain was designated the Mt. Shasta Recreation Area by a 1926 Secretary of Agriculture Order, and a National Natural Landmark in 1976 by the Secretary of Interior. It has received national publicity for its potential volcanic activity. It is an active strato volcano and the second

highest mountain in the Cascade Range. Formed by periodic volcanic activity over the last 100,000 years, Mt. Shasta and its surrounding lands display many unique geologic features including numerous lava flows, mud flows, seven glaciers, and three waterfalls. The area offers a variety of activities including cross-country skiing, mountain climbing and hiking.

Trinity Alps

The Trinity Alps Wilderness is within portions of the Shasta-Trinity, Klamath and Six Rivers National Forests. This wilderness area has 405,128 acres of contrasting topography and vegetation; elevations range between 2,000 and 9,000 feet. The eastern portion of the Alps is characterized by high granite peaks, alpine meadows, and mountain lakes. The west side is rugged timbered terrain. Unique geologic features include: Limestone Ridge, Manzanita Cave and Soldier Creek Cave. Major peaks dominate the area. More than 528 miles of hiker/equestrian trails are maintained for recreation use. About 19 miles of the PCT pass through the area. Within the wilderness there is a 3 mile segment of New River and a 14 mile segment of the North Fork Trinity River; both are components of the National Wild and Scenic Rivers System. Twelve miles of Virgin Creek, 18 miles of Canyon Creek and 12 miles of North Fork Trinity are being considered for Wild and Scenic River status. Seasonal mining takes place in portions of the wilderness. Fisheries and wildlife as well as sensitive plants are important considerations here.

Yolla Bolly-Middle Eel

The 146,696 acre Yolla Bolly-Middle Eel Wilderness lies within the boundaries of the Mendocino, Six Rivers, and Shasta-Trinity National Forests (36,805 acres are on the Shasta-Trinity). Its elevation ranges from 2,600 to 7,863 feet. Devils Hole and Buck Creek are extremely rugged although most topography is generally moderate. A short segment of the South Fork Trinity River is being considered as an addition to the National Wild and Scenic Rivers Systems.

Further Planning Areas

Mt. Eddy Roadless Area, containing 7,720 acres, is the only area in this category. Areas in the further planning category are to be considered for both wilderness and non-wilderness options during the Forest planning process. (See Appendix C for detailed information on Mt. Eddy.)

Released Roadless Areas

The 1984 California Wilderness Act released 29 inventoried RARE II roadless areas totalling 306,060 acres, to be managed for multiple uses other than wilderness (see **Table III-21**). A brief description of each of these areas is found in Appendix C. By law, wilderness designation will not be considered for these areas during this planning cycle.

A substantial portion of a number of these areas has been roaded since the RARE II inventory. These areas are: Bonanza King, Dog Creek, Eagle, East Girard, Salt Gulch, Slate Creek and Wells Mountain.

Controversy over the management of 16 of these areas emerged during a public comment period held between August, 1986 and January, 1987. This public comment period was associated with the previous Draft Environmental Impact Statement (Draft EIS) which was withdrawn. Some segments of the public urge intensive resource management in these roadless areas, including road construction and timber harvesting. Others support proposals for non-development, such as semi-primitive non-motorized recreation prescriptions and/or Research Natural Area designation.

These 16 roadless areas contain 167,076 acres. Of that total, 74,369 acres have been inventoried as tentatively suitable for timber management. The areas contain the following mix of inventoried visual quality objectives (VQOs - a classification based on scenic variety class and sensitivity level):

9,900 acres of Retention
57,070 acres of Partial Retention
72,260 acres of Modification
27,850 acres of Maximum Modification

Demand. Public demand for the existing wildernesses, as measured through recreation use, is low to moderate.

Recreation visitor days (RVDs) for 1989:

Wilderness	RVDs
Castle Crags	8,000
Chanchelulla	1,000
Mt. Shasta	41,000
Trinity Alps	181,000
Yolla Bolly Middle Eel	3,000

Projected demand for wilderness and roadless recreation opportunities is expected to increase significantly in the next five decades.

Projected total RVDs (based on RPA disaggregation):

Year	RVDs
1989	234,000
2000	255,000
2010	318,000
2040	372,000

Projected demand for wilderness and roadless recreation opportunities is expected to increase significantly in the next five decades. The 1989 RPA document "An Analysis of the Outdoor Recreation and Wilderness Situation in the United States 1989-2040" projects future increases in wilderness demand, based on projected future demand for activities commonly occurring in Wildernesses. Day hiking is projected to increase 193 percent; backpacking 155 percent; general outdoor photography 105 percent; and wildlife observation and photography 74 percent. The report goes on to say that increasing environmental concern, needs for biological monitoring, decreasingly available undisturbed spaces, and other trends strongly support a prediction for demand growth of non-recreational uses of wilderness.

There are scattered parcels of private land within the Wildernesses. Because of potential conflicting resource management objectives, it is desirable to acquire these inholdings. There are also conflicts between recreationists and cattle grazing primarily related to adverse effects on drinking water sources. Trail maintenance has been deferred for many years; therefore, many trails require extensive rehabilitation. A number of trails, some built during intensive gold mining days and others located for early grazing use, should be closed and/or relocated to reduce safety and erosion problems.

Management Opportunities

In the Mt. Eddy Further Planning Area, a number of potential uses exists, e.g., dispersed recreation, developed recreation, wilderness, research natural area, wildlife and timber management.

Opportunities exist to manage the remaining 16 released roadless areas under a variety of prescriptions which are explained in alternative development. Most of these roadless areas are designated as habitat conservation areas for spotted owls (refer to the discussion in the Wildlife Section). The wilderness prescription would not be used for these areas during this planning cycle.

An Environmental Impact Statement and Wilderness Management Plan have been prepared for the Mt. Shasta Wilderness. Management would focus on restoring and preserving resource conditions while providing a quality wilderness experience. An Environmental Assessment and Wilderness Management Plan for the Castle Crags Wilderness and an Environmental Impact Statement and Wilderness Plan for the Trinity Alps Wilderness are also in the process of being prepared. Forest personnel are just beginning the planning and environmental documentation process for the Chanchelulla Wilderness. The Yolla Bolly-Middle Eel Wilderness Management Plan is being reviewed and updated jointly by the Mendocino, Six Rivers, and Shasta-Trinity National Forests. These wilderness management plans would provide specific management direction in support of the general standards and guidelines found in the proposed Forest Plan.

Figure III-8
Forest Wildernesses

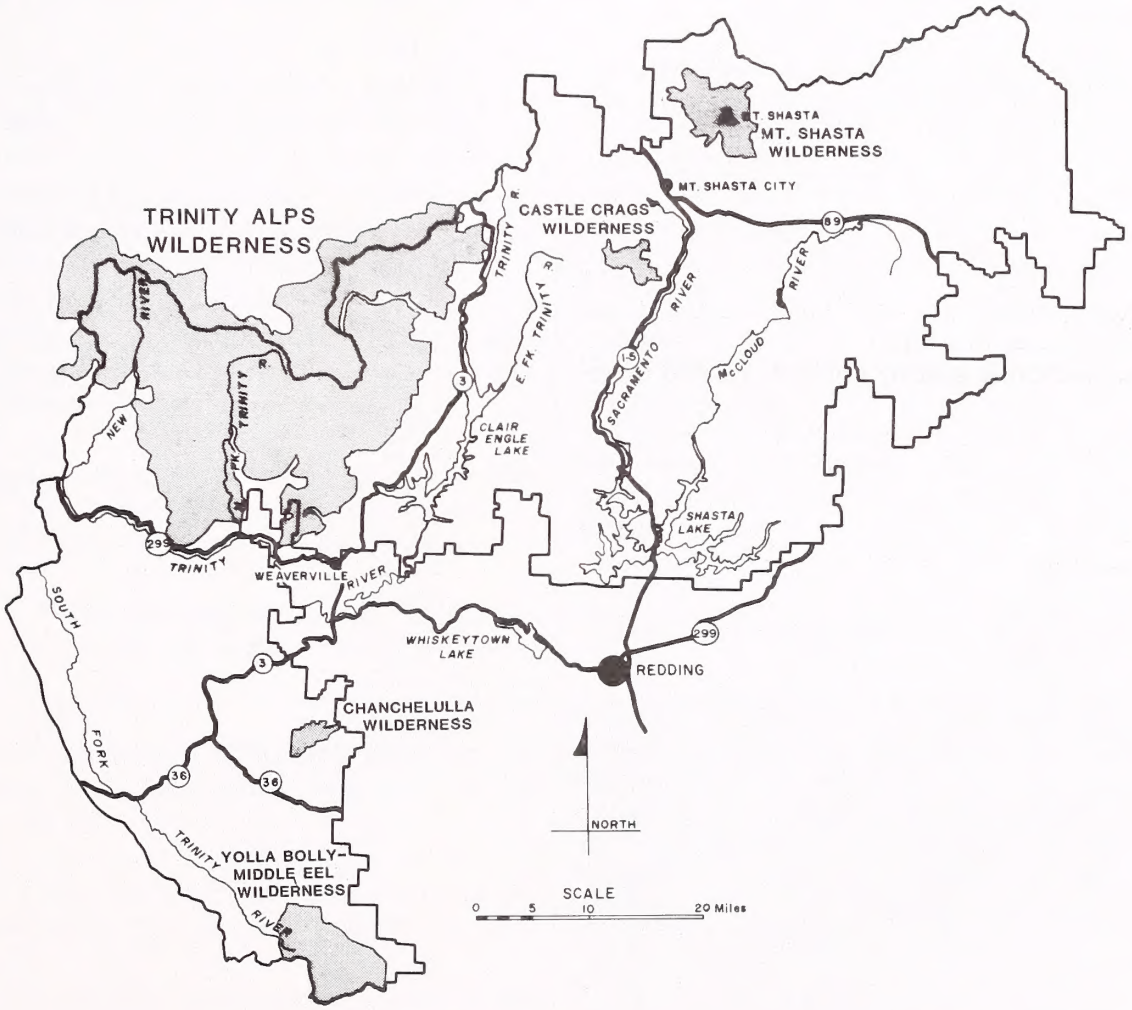


Table III-21
Released Roadless Areas

	Name	Total Acres	Acres Tentatively Suitable for Timber Management
	Backbone	9,976	3,960
	Bell-Quinby B	11,707	6,455
	Bonanza King	16,386	6,219
*	Castle Crags B	1,732	851
*	Chanchelulla	3,865	2,160
	China Springs B	707	413
*	Chinquapin	21,520	13,290
	Cow Creek	23,152	5,557
*	Devils Rock	13,896	9,250
	Dog Creek	5,543	4,919
	Eagle	6,798	3,396
*	East Beegum	7,963	1,274
*	East Fork	5,195	3,041
	East Girard (total acres)	27,914	22,513
*	(Nature Conservancy Portion only)	(226)	(140)
*	Fisher Gulch	4,472	1,437
	Kettle Mountain	4,865	2,590
*	Little French Creek	11,227	2,301
*	Mt. Shasta B	2,958	1,734
	Murphy Glade	1,018	980
	Panther	11,727	2,683
*	Pattison	28,326	13,823
*	Penney Ridge	4,844	724
	Salt Gulch	6,657	4,178
	Slate Creek	6,616	6,064
*	South Fork	17,261	5,372
*	Underwood	3,219	2,035
	Wells Mountain	6,144	4,921
*	West Beegum	5,480	1,124
*	West Girard	34,892	15,813
	TOTAL	**306,060**	**149,077**

* Sixteen areas of concern to the public

24. WILDLIFE (General)

Public Issues

Two major public issues focus on wildlife:

1. **How should the Forests' vegetative resources be managed for ecosystem diversity? Special consideration would be given to providing habitats that maintain or enhance populations of threatened and endangered (T&E) species and viable populations of sensitive species and/or management indicators.** *(Public Issue #2).* (Refer to the Biological Diversity and Riparian Area Sections in this Chapter and to the T&E write-up at the end of this Section.)

There is public concern that a wide variety of ecosystems should be maintained on the Forests to specifically provide for the:

(a) maintenance and/or enhancement of habitats for Federally listed T&E species (plants and animals);

(b) maintenance and/or enhancement of habitats sufficient to provide for viable populations of all other existing species (plants and animals);

(c) maintenance and/or enhancement of the Forests' existing ecosystems and the biodiversity (plants and animals) associated with them; and

(d) maintenance and/or enhancement of special elements or components of these ecosystems (i.e., snags, down logs, cliffs, vegetative seral stages, etc.)

2. **How much of the older vegetative seral stages existing on the Forests should be retained?** *(Public Issue #3)*

There is public concern that sufficient amounts of old growth habitats be retained and/or enhanced on the Forests to provide for:

(a) viability of all species (plants and animals) requiring this type of habitat for all or part of their lifecycle; and

(b) sufficient representation and retention of this ecosystem component for the sake of maintaining vegetative biodiversity.

There is also a related issue:

How wide should riparian management zones (RMZs) be and what management activities should be allowed within them? *(Public Issue #13).* (Refer to the Riparian Area Section in this Chapter.)

Discussion of Public Issues

Wildlife Habitat/Ecosystem Diversity. Along with their concern about global warming, ozone depletion, acid rain, and deforestation, people are also concerned about wildlife and plant species. The public wants habitat to be retained and restored so that species populations are well distributed and maintained at healthy levels.

Certain components and types of habitat are important to wildlife breeding and survival. Over time, forest management activities have decreased the amount of snags, down logs, hardwoods, and older over-mature forests that are available for wildlife. This decrease has led to concerns about the effect this is having on wildlife.

An Interim Forest Directive requires implementation of standards for diversity, snags, seral stages, and dispersion for wildlife habitat (Forest Service Handbook, FSH, 2409.24). Although these measures are being implemented to retain some snags, down logs, and older over-mature forests, concern remains that these measures may not be sufficient enough to be beneficial for wildlife.

Older Over-Mature Habitat. The public is also concerned about wildlife species that require older over-mature habitat for their survival. Older over-mature habitat has declined in the west, and people are concerned about retaining it for themselves and for the wildlife that inhabit it.

Current Management Situation

The Forests' diversity of habitats helps provide for the needs of about 370 wildlife species either seasonally or on a year-round basis. (Refer to the Biological Diversity Section in this Chapter). The Forests' wildlife are made up of 240 species of birds, 85 species of mammals, and 45 species of reptiles and amphibians. The quality and quantity of habitat varies from optimum for some species to marginal for others.

Along with amphibians, reptiles, birds and mammals, there are hundreds, if not thousands, of invertebrate species of a less conspicuous nature including arthropods (insects, crayfish, spiders, scorpions, ticks, centipedes, and millipedes), and mollusks (clams, slugs, and snails). There is limited data available on the needs and occurrence of these invertebrates. In addition, very little is known about arthropods or mollusks. Therefore,

this section will focus only on birds, mammals, reptiles, and amphibians.

Development and implementation of the wildlife program on the Forests is a complex and comprehensive effort. For ease in understanding the program is displayed and referenced in a five year wildlife program strategy.

On National Forest lands, the Forest Service is responsible for managing wildlife habitat. The California Department of Fish and Game (DFG) and the U.S. Fish and Wildlife Service (USFWS) share the responsibility for managing wildlife populations. Because the success of species management is dependent on habitat and population management, close coordination is required between the three agencies. Memorandums of Understanding outline each agency's roles and responsibilities in this cooperative effort.

The Forest Service, including the Shasta-Trinity National Forests, has formed partnerships with many public groups interested in wildlife and habitat conservation. National or local Memorandums of Understanding have been developed with the DFG, the Mule Deer Foundation, Defenders of Wildlife, National Wildlife Federation, Rocky Mountain Elk Foundation, National Audubon Society, and many more groups. Several on-going partnerships between the Shasta-Trinity and outside organizations are active in conservation programs.

The public enjoys wildlife for consumptive (hunting, trapping, etc.) and/or non-consumptive (photography, viewing, scientific study, etc.) purposes.

Consumptive Species

Generally, consumptive wildlife species can be divided into several groups:

Big game -- includes black bear (Ursus americanus); elk (Cervus canadensis); mule deer (Odocoileus hemionus); and wild pig (Sus scrofa).

Deer hunting is one of the most popular hunting sports on the Forests. The DFG administers the hunting of resident animals. The actual seasons, levels of harvest, etc. are regulated by the California Fish and Game Commission (FGC). Together, the DFG and USFWS administer regulations for hunting migratory species.

Small game -- includes gray squirrel (Sciurus griseus); Douglas squirrel (Tamiasciurus douglasii); hares (Lepus spp.); and rabbits (Sylvilagus spp.).

Upland game -- includes band-tailed pigeons (Columba fasciata); blue grouse (Dendragapus obscurus); mountain quail (Oreortyx pictus); mourning dove (Zenaida macroura);ruffed grouse (Bonasa umbellus); turkey (Meleagris gallopavo); and California quail (Callipepla californica).

Waterfowl -- includes ducks and geese (family Anatidae); and

Furbearers -- includes bobcat (Lynx rufus); beaver (Castor canadensis); coyote (Canis latrans); and gray fox (Urocyon cinereoargenteus).

Non-Consumptive Species

Non-consumptive species, as well as consumptive species, provide opportunities for viewing, photography, nature study, and associated experiences of camping, hiking, and boating. Most wildlife species are in the non-consumptive category. Included in this category are species that are listed as threatened or endangered by the State and/or Federal Government, or as sensitive by the Regional Forester.

Management Indicators

The management indicator approach is used to reduce the complexity of discussing all the wildlife species on the Forests. Assemblages or groups of wildlife associated with vegetative communities or key habitat components have been identified and selected as Management Indicators. These assemblages were chosen because: (a) they represent the vegetation types, seral stages, and special habitat elements necessary to provide for all wildlife species on the Forests, and (b) their population changes are believed to indicate the effects of management activities on other wildlife populations. Management options for the assemblages will be directed under the standards and guidelines and implemented through the five year Wildlife Program Strategy. Not all of these assemblages are used as management indicators for every project, however. (Refer to Appendix G for a complete list of common and scientific names of the species within the assemblages.)

Assemblages of Management Indicators include:

(1) Late Seral Stage wildlife assemblage;

(2) Openings and Early Seral Stage wildlife assemblage;

(3) Multi-habitat wildlife assemblage;

(4) Snag and Down Log wildlife assemblage;

(5) Riparian wildlife assemblage;

(6) Aquatic wildlife assemblage;

(7) Hardwood wildlife assemblage;

(8) Chaparral wildlife assemblage; and

(9) Cliffs, Caves, Talus, and Rock Outcrops wildlife assemblage

Each assemblage represents at least one of three categories of management indicators.

1. **Featured Species** -- Species commonly hunted or trapped, or of high value for non-consumptive recreational uses;

2. **Species Habitat Indicators** -- Species with specific and potentially limiting habitat requirements that may be significantly affected by Forest management activities; or species associated with special habitat elements; and

3. **Ecological Indicators** -- Species whose population parameters can be used to show the environmental conditions (quality and quantity) of habitats for other species or ecosystems.

A Discussion of the Wildlife Assemblages -- Management Indicators (Table III-22)

1. Late Seral Stage Wildlife Assemblage

Many wildlife species are associated with forested habitats that are in the late seral stages (see Appendix G for a description of seral stages). There are three later seral stages included in this assemblage: 4a, 4b-c, and 4c-older. The average age of these older forest stages is greater than 110 years; 4c-older (old growth or older over-mature) is greater than 180 years. These forests have large diameter trees which are at least 21 inches around. Tree cover and density range from fairly open canopies to dense canopies of multiple layers of trees. Older over-mature habitat is included in this category. These seral stages are important to wildlife as they provide cover, thermal cover, large trees for nesting, large snags and down logs, vertical diversity, older over-mature habitat, etc.

Forested habitats are managed indirectly through application of standards and guidelines for such things as snags, hardwoods, and seral stages. Current management policy is to maintain sufficient seral stage diversity, including 4c-older seral stage, to maintain viability of the wildlife species associated or dependent on these later stage habitats (refer to Forest Service Handbook [FSH] 2409.24).

At least 15 percent of each forest type is maintained in these three later seral stages. Five percent or more is maintained in the 4c-older stage. At least five percent is maintained in the 4a stage which has a fairly open canopy. Five percent or greater is maintained in the 4b-4c stage which has a moderately dense canopy closure of at least 40 percent. Along with these requirements, reserved areas such as wilderness, wild and scenic rivers, research natural areas, and spotted owl habitat conservation areas have some late seral forest diversity which provides habitat needed for species dependent or associated with older over-mature forests.

Through forest management activities, the later seral stages and the wildlife species assemblage associated with them need to be monitored. Some species represented in this assemblage are: northern spotted owl, goshawk, fisher, marten, Trowbridge shrew, and northern flying squirrel.

Table III-22
Wildlife Assemblages and the Management Indicator Category

Wildlife Assemblage	Category
1. Late Seral Stage	Ecological Indicator
2. Openings and Early Seral Stage	Ecological Indicator
3. Multi-Habitat	Featured Species
4. Snag and Down Log	Habitat Indicator
5. Riparian	Habitat Indicator
6. Aquatic	Habitat Indicator
7. Hardwood	Habitat Indicator
8. Chaparral	Habitat Indicator
9. Cliffs, Caves, Talus, and Rock Outcrops	Habitat Indicator

2. Openings and Early Seral Stage Wildlife Assemblage

Meadows, shrublands, and early forest seral stages provide diversity within the forest landscape. Natural openings are maintained to provide wildlife habitat. Early forest seral stages are created through even-aged timber management activities. These openings are temporary as they grow into older conifer plantations. Other openings are created in a mosaic pattern over the forest landscape. At least five percent of the Forests is maintained in meadows, shrublands, and young grass/forb plantations. Another five percent is maintained in plantations of shrubs, seedlings, and saplings (refer to FSH 2409.24 for standards and Appendix G for description).

Many wildlife species are associated with or dependent upon openings. Openings are a unique habitat among forest stands. They provide forage areas for some big game species and habitat for small birds and mammals which, in turn, become prey species for carnivores.

Through forest management activities, there is a need to monitor the openings, early seral stages, and the wildlife species assemblage associated with them. Some species represented with this assemblage are: the racer, western meadowlark, California quail, song sparrow, western harvest mouse, brush mouse, brush rabbit, California vole, and deer.

3. Multi-Habitat Wildlife Assemblage

Some wildlife species depend upon a variety of vegetated habitats, seral stages, and special habitat components. Their needs may vary from winter to summer, from night to day or during breeding season, for example. A number of harvest species are represented in this multi-habitat assemblage: black bear, mule deer, elk, and turkey. With forest and specific habitat management, there is a need to monitor these species and the habitat attributes of the assemblage.

Black Bear - The black bear is a big game species found throughout the Forests. Between 300 and 400 of them are harvested annually. Bear harvest is regulated by the State. Black bear are extremely vulnerable to hunting and poaching in well roaded areas. Black bear require a diversity of habitats to provide for their diet and hibernation needs. Oaks and berry producing shrublands are especially important.

The year-round need of bears is provided partially by management direction for down logs, openings, early seral stages, caves, and by additional requirements for vehicle access management.

Bear and people have had encounters at some campgrounds on the Forests. These encounters are significantly greater during years of drought when forage becomes scarce. The problem is being partially resolved through better trash management and education of the visiting public.

Because of the demand for bear hunting, there is economic value associated with bear management. Bears around campgrounds also result in increased costs to recreation management.

Mule Deer- Two sub-species of mule deer live in the Forests: Rocky Mountain mule deer (O. h. hemionus) and black-tailed deer (O. h. columbianus). These deer interbreed. Generally, in the extreme northeast corner of the Forests, some deer genetically appear to be Rocky Mountain mule deer. On the rest of the Forests, the deer appear to be black-tailed mule deer. Because of the confusion over sub-species, the deer on the Forests are referred to at the species level, mule deer.

Deer are found throughout the Forests and their population is estimated to be 62,000. Suitable range and habitat is available for the entire deer population. Between 3,000 and 4,000 deer are harvested annually. Deer numbers are capable of sustaining a much higher harvest, particularly on the Trinity Forest; however, the type, timing, and duration of the hunting season is not conducive to heavier harvests.

Deer are managed under four separate deer herd management plans in cooperation with the DFG: Hayfork, McCloud, Weaverville, and Yolla Bolly. Also, the counties exercise deer management authority via Sections 458 and 459 of the Fish and Game Code of California. Under this authority the Boards of Supervisors have veto power over any doe hunts in their respective county.

Deer herd management plans identify general herd and habitat management goals. Management for deer includes both direct and indirect management.

Direct management consists of water developments, fencing of riparian areas, prescribed burning of chaparral, road closures, and administrative vehicle control areas during hunting seasons. In addition, selected bitterbrush areas are specifically managed for deer on the McCloud Flats and in the Military Pass area on Mt. Shasta District. Browse improvements on winter range habitat also occur. Financing for these projects comes directly from Forest Service funds, DFG (Hill Bill), partnership contributions (Mule Deer Foundation), and county fines monies (administered by County Board of Supervisors).

Indirect habitat improvement occurs through coordination with other resource programs. Over time, coordinated resource planning results in the management of

key habitat elements for deer. Direction is provided for hardwood retention and seral stage diversity to benefit deer.

Deer poaching is a problem in some areas on the Forests. This problem is being addressed in transportation planning for large projects, and measures are being taken to reduce overall road density. During the deer hunting season, a road closure area is established to decrease disturbance to deer and increase the quality of hunting. This multi-Forest coordinated closure is being considered for expansion by private landowners in the McCloud area.

Deer hunting boosts the local economies during hunting season. Additional discussion on the economic value of deer is found later in this section under "Economics: Supply and Demand."

Elk - Historically, elk were native to this area. By the late 1800's elk were no longer believed to be present on the Forests. Rocky Mountain elk was reintroduced in 1916 near what is now the east-side of Shasta Lake. A small herd of Roosevelt elk was reintroduced onto the Klamath National Forest north of the Trinity Alps in 1990. The herd is expected to grow larger in the future and may expand into habitat in the northern Trinity Forest. Elk have also been observed on the McCloud Ranger District. These sightings could be members of the Shasta Lake herd or Grass Lake herd from the Klamath Forest. The Grass Lake herd became established several miles north of Mt. Shasta after emigration from Oregon. The Shasta Lake elk herd is hunted under a permit system (10 permits per year).

Elk occupy about 150,000 acres of habitat mostly on the Shasta Lake District. Meadow restoration projects have begun through cooperative efforts with the Rocky Mountain Elk Foundation. Another 280,000 acres of potentially suitable habitat needs to be analyzed and considered for reintroductions and elk herd expansions in the Trinity area.

Turkey - Merriam's turkey populations expanded onto the Shasta Lake District after they were introduced to Shasta County in the 1960's. The population is estimated at about 4,000. Turkeys now inhabit about 250,000 acres around Shasta Lake east of Interstate 5. Another 80,000 acres, in other portions of the Forests, can be managed for introduction of them. Reintroduction efforts should be analyzed in cooperation with the Wild Turkey Federation.

4. Snag and Down Log Wildlife Assemblage

Snags and down logs are components of decadence and are diversity requirements for many wildlife species. Past timber management practices have eliminated a large portion of this resource. The current management practice is to maintain sufficient large snags and logs for the wildlife species requiring this key habitat component. (Refer to the FSH 2409.24 for the standards.)

There is a need to monitor the impacts that timber and fire management activities may have on the snag and down log components and the wildlife assemblage associated with them. Some species represented by this assemblage are: long-toed salamander, rubber boa, pileated woodpecker, black bear, western screech owl, pygmy owl, sawwhet owl, and tree swallow.

5. Riparian Wildlife Assemblage

Nationwide, there is an increased emphasis on riparian management. Riparian vegetation is dependent on a high water table. Within riparian areas are a wide diversity of plant and wildlife species. Many wildlife species are dependent on this habitat type and adjacent vegetation. With the dense canopy providing cover, shade, and cooler temperatures, riparian forests provide corridors, connective habitat, and migration routes.

Timber and range management activities can impact riparian areas through a reduction in habitat and change in plant species composition. This habitat can also be impacted by the removal of surrounding canopy and increasing air and water temperatures. Roads, trails, and campgrounds within riparian areas can also alter this habitat. Current management direction is to maintain riparian management zones (RMZs) of 100 feet along perennial streams and lakes, and 50 feet along nonperennial streams and wetlands. The use of Best Management Practices (BMPs) helps provide for water quality protection.

Because of the emphasis placed on riparian management and the significant use this habitat receives by wildlife, the riparian wildlife assemblage should be a management indicator. The riparian assemblage would represent species using the terrestrial vegetation of the riparian zone. With timber, range, and recreation management activities, there is a need to monitor the riparian areas and the wildlife species assemblage associated with them. Wildlife species dependent on various riparian habitats will be monitored to determine the impacts of Forest Service management activities. Some species represented by this wildlife assemblage are: California red legged frog, black salamander, yellow warbler, willow flycatcher and fisher.

6. Aquatic Wildlife Assemblage

There are several large reservoirs, lakes, rivers and streams within the Forests. Along with fish, many wildlife species are dependant on water for their living or fish for

their diet. Current management direction is to maintain RMZs of 100 feet along perennial streams and lakes, and 50 feet along nonperennial streams and wetlands. The use of BMPs helps provide for water quality protection. Aquatic systems are also managed through fishery and riparian management.

Aquatic dependent wildlife rely on good water quality, adequate water quantity, riparian and forested cover, fish or aquatic insects, and large woody debris. These wildlife can be grouped within an aquatic wildlife assemblage. Some species represented by this assemblage are: tailed frog, western pond turtle, bald eagle, river otter and water shrew. A partnership with Duck's Unlimited can be established to manage areas for ducks, shorebirds and other aquatic dependent wildlife.

7. Hardwood Wildlife Assemblage

Hardwoods are found throughout the Forests either in pure stands or as individual trees in conifer forest types (see the Biological Diversity Section in this Chapter). Wildlife species use hardwoods for forage, nesting, and shelter. Acorn production from the oaks is especially important as a food source. Many hardwood species are found on sites that are unsuitable for management activities, so there is little likelihood they will be significantly altered by timber management practices. Some hardwoods, such as black oak, can be found on sites suitable for timber production.

Hardwoods are managed through diversity requirements. Where hardwoods exist in pure stands, current management direction is to retain most of the existing basal area per acre unless managing the stand for wildlife purposes. Where hardwoods occur naturally within existing conifer types, some hardwoods are retained.

Hardwoods have a high value to wildlife. With reduction of biomass in timber management, there is a need to monitor hardwoods and the wildlife species assemblage associated with them. Some species represented by this assemblage are: acorn woodpecker, scrub jay, evening grosbeak, white breasted nuthatch and Hutton's vireo.

8. Chaparral Wildlife Assemblage

Chaparral is the general name given to a diverse combination of shrubs that provide habitat for many wildlife species. Chaparral is maintained as a shrubland. It is also included within the early seral stage category. Through time, plantations cycle from the early seral stage to the later forested seral stages.

Chaparral habitat is important for a variety of wildlife. Many rodents inhabit chaparral, and deer and other herbivores find forage here. Chaparral can vary in elevation, and can provide winter range, summer range, escape cover and fawning areas for deer. The shrubs provide flowers, seeds, and leaves for birds in addition to providing cover and nest sites.

With chaparral and species habitat management, there is a need to monitor chaparral and the wildlife species in its assemblage. Some species represented by this assemblage are: bushtit, green-tailed towhee, wrentit, and mountain lion.

Prescribed burning of selected shrublands is the major form of chaparral management on the Forests. The majority of this work has been accomplished for the enhancement of forage for deer. Prescribed burning creates a mosaic that benefits many other species inhabiting the chaparral community.

9. Cliffs, Caves, Talus, and Rock Outcrops Wildlife Assemblage

Cliffs, caves, talus, and rock outcrops are geologic features that provide unique habitat for wildlife. These features provide nesting, denning, and shelter, and they are managed on a site-by-site basis. Some sites are considered as special features and are managed for their protection. Because of rough, broken terrain and less vegetation, these features are normally protected from change. For example, cliffs and talus are protected because they are avoided by construction activities. Some species represented by this assemblage are: Shasta salamander, canyon wren, peregrine falcon, and Townsend's big eared bat.

Economics: Supply and Demand

Current Supply-Demand Situation. Game species on the Forests provide hunting opportunities for local sport hunters from Klamath, Lassen, Modoc, Shasta, Siskiyou, Tehama, and Trinity Counties. Hunters from as far south as the Los Angeles Basin, as well as the states of Oregon and Nevada, also frequent the area. Expenditures by the sport hunting public are an important source of income for local businesses and contribute significantly to the economy of local counties.

There are an estimated 282,000 consumptive, wildlife user days (WUDs) on the Forests. In order of highest to lowest are: big game hunting, upland game, small game, trapping (furbearers), and waterfowl hunting. The estimated value of these WUDs is $16,474,000. Primary consumptive species are mule deer, black bear, quail, wild turkey, band-tailed pigeon, and gray squirrel.

Based on the total number of hunters and hunting licenses sold between 1981-1989, demand for consumptive

use in Northern California, for most of the above species, has steadily decreased at an average rate of 3 percent per year.

The demand for high quality (high success rates) deer hunting remains unfilled. This is evidenced by the number of hunters applying for special hunts in the north state. Also, the demand for turkey hunting is continuing to grow. Shasta County is the turkey hunting center for the State.

It is estimated that there are between 20,000 and 30,000 deer hunters on the Forests each year. Small and upland game hunters combined are estimated at 30,000. The total number of trappers is unknown, but proportioning out the reported harvest results in a value of $50,000 per year being taken in pelts of various furbearers.

Non-consumptive use and demand on the Forests nearly equals that of consumptive use. The monetary value, though, is much higher at $37,250,400. Current demand for non-consumptive species is primarily in the form of observation, nature study, photography, and so on. Bird watching is one of the most popular and widespread hobbies. There are many outdoor recreation and wildlife groups, based out of Redding and Mt. Shasta, that enjoy wildlife viewing and study on the Forests. With the current high use and expected increase in the use, there is a need to develop wildlife viewing sites and interpretation on the Forests.

Future Supply-Demand Situation. The demand for consumptive species (hunting, trapping, etc.) is expected to decrease. The 1990 RPA program predicts a six percent decline in big game hunting and a 17 percent decline in small game hunting. The demand for high quality (high success rate) deer hunting will continue.

The demand for non-consumptive use of wildlife species on the Shasta-Trinity National Forests is increasing at a faster rate than consumptive use and may result in protective legislation and allocation of habitats. Nationwide non-consumptive use is increasing significantly. The 1990 RPA program predicts an increase of over 150 percent in 50 years.

Management Opportunities

There are many opportunities to manage habitat and ecosystem diversity. Wildlife habitats are managed through project design, habitat improvements, protection, and mitigation. Wildlife habitats are also managed through application of standards and guidelines for riparian areas, snags, down logs, hardwoods, and seral stages, for example.

Several habitat improvements are needed on the Forests to benefit a variety of species. There is an opportunity to increase the viewing and hunting possibilities for the featured hunted species: deer, bear, elk and turkey. Water, as a drinking source, has a low availability and poor distribution, especially during a drought cycle. Guzzler installation, spring development, riparian improvements and closures can help meet drinking water needs. Prey and vegetative forage needs to be maintained or increased in chaparral, hardwood, and conifer forest communities. Prescribed fire or crushing of decadent browse, orchard pruning, oak thinning, etc. will improve food availablity, abundance, variety, and nutritional value.

Two emerging programs are the Watchable Wildlife and Neotropical Migrant Bird Programs. The Watchable Wildlife Program emphasizes increasing the access, interpretation, and education for public enjoyment of viewing, nature study, and photography of wildlife. The goal of the Neotropical Migrant Bird Program is to maintain, enhance, and restore declining populations of these birds. The need and opportunity exists to determine the status and possible causes of population changes of these migrant birds. Mapping habitat changes, bird banding, and breeding bird surveys will help determine the status and changes. There is also an opportunity to market the species, habitat, and program for Watchable Wildlife and Neotropical Migrant Birds. Creation of view sites, viewing pamphlets and brochures, news releases, magazine articles, local presentations, etc., can be used to promote the enjoyment of wildlife viewing and nature study opportunities. An opportunity exists to increase partnerships with civic, recreation, and conservation groups interested in these species.

Several funding sources are available for habitat management: program management funds, challenge cost share funds, partnership contributions and Knutsen-Vandenberg (KV) funds. The opportunity to manage habitat beneficially is increasing because of the increased emphasis on wildlife. Funding has increased in the challenge cost-share/partnership programs. Between $100,000 and $300,000 worth of work is being accomplished annually under the Forests' wildlife KV program.

There is also an opportunity to increase the wildlife habitat management program through increasing partnerships with other agencies and sports groups. Currently about 2,000 acres are receiving benefits from partnerships with private, state and Federal agencies. An additional 1,500 acres of direct habitat improvement (i.e., prescribed burns) and 5-10 structures (guzzlers, barricades, etc.) are also being constructed.

Even though there will be a decrease in the volume of timber harvested, there will remain a high need and opportunity for mitigation, enhancement, and protection. The need and opportunity to implement the deer

herd management goals and objectives will continue. The need and opportunity to implement the Trinity River basin wildlife management plan for riparian and upland habitats will also continue.

The potential exists to manage a substantially larger wildlife program on the Shasta-Trinity National Forests. The number of acres and structures completed annually could increase significantly over the present. There is an opportunity to stock other areas with elk and turkey transplants. With the growth of existing and stocked populations of elk and turkey, there will be an opportunity for increased viewing and hunting of these species. Along with elk, turkey, and deer, there is a need and opportunity to manage habitat (berry fields, down logs, den sites) for bear.

Wildlife habitat is affected not only by the amount of timber harvested, but by the type of harvest as well. The harvest effect on habitat successional stage may be either positive or negative depending upon the species habitat requirement. Opportunities exist to minimize the negative effects and to accentuate the positive through consideration of wildlife habitat requirements during compartment and project planning.

There are standards for maintaining later forest seral stages (including older over-mature habitat) for wildlife. There is an opportunity to design land allocations and prescriptions to benefit wildlife habitat, including older over-mature habitat associated species. Along with the current management allocations (wildernesses, wild and scenic rivers, research natural areas, and spotted owl conservation habitat areas) habitat for furbearers, larger riparian management zones, corridors, special interest areas and spotted owl dispersal can be managed for the benefit of the later seral stage habitat. There is also an opportunity to increase the standards for hardwood retention, snags and down log density, and the protection of meadows, wetlands and riparian areas for wildlife benefit.

Road construction is also a wildlife management concern. The effect of new roads is two-fold. First, there is a reduction of habitat as vegetation is removed for right-of-way clearing. Second is the increased use of the newly roaded area by recreationists. Recreation vehicle traffic and other dispersed recreation activities increase near the roads. Through consideration of wildlife habitat needs in planning for roads and through temporary or permanent closure of roads, negative impacts can be minimized. Road density needs to be decreased to lessen wildlife disturbance and harassment. Seasonal or permanent road closures and managing road traffic through design and maintenance can be done to decrease access. An opportunity exists to expand the McCloud Flats seasonal road closure onto private lands.

The developments on lands of intermingled ownerships within the Forests is another wildlife concern. Not only is there potential habitat loss from vegetation removal, but disturbances reduce the effectiveness of this land and the surrounding land as habitat. This is a particular concern with regards to deer herds. Availability of winter range is a limiting factor to deer herd size. When deer herd winter range is on private land that has potential for development, the biological potential becomes limited on National Forest land. Opportunities exist to lessen this impact through acquisition or exchange for lands that are key wildlife habitats.

There is a need to monitor the implementation and effectiveness of standards and guidelines, management prescriptions, projects, etc. The wildlife assemblages will be used as management indicators and some of them will be monitored. A monitoring and implementation plan is needed to guide the wildlife program accomplishments. There is a need to verify management assumptions, models, prescriptions, and concepts. Other opportunities and needs are to upgrade the Geographic Information System (GIS) technology and application, increase use of the ecosystem approach, gain additional data on species population levels and habitat conditions, and use an ecosystem approach for land stewardship.

Future management direction should reflect a need to maintain special habitats, habitat components, and distribution of habitats while maintaining viable populations of all wildlife species.

WILDLIFE (Threatened, Endangered, and Sensitive Species)

Public Issues

There is one public issue which focuses on threatened, endangered, and sensitive animals. It is:

How should the Forests' vegetative resources be managed for ecosystem diversity? Special consideration would be given to providing habitats that maintain or enhance populations of threatened and endangered (T&E) species and viable populations of sensitive species and/or management indicators. *(Public Issue #2)*

There is also one related public issue:

How much of the older vegetative seral stages existing on the Forests should be retained? *(Public Issue #3)*

Discussion of Public Issues

Nationwide there has been a reduction in certain fish, wildlife, and plant species due, in part, to pesticide contamination, excessive timber harvesting, reduction in water quality, and a reduction in the quantity and quality of available habitat. This reduction has resulted in placing certain species on Federal and/or State lists of threatened and endangered (T&E) species. The U.S. Forest Service has management authority only over those elements related to habitat alteration on National Forest lands.

Forest management activities can alter the amounts of available and suitable habitats such as older over-mature stands (old-growth) or special components of such stands (snags and dead/down material). In addition to direct alterations of habitat, the potential exists for indirect disturbance from noise and vehicle and people harassment.

Current Management Situation

Policy direction for the Forest Service is to manage "habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain viable populations of such species." Forest Service activities and programs are to assist in the recovery of T&E species and to avoid actions that may cause a species to become threatened or endangered.

State/Federal Lists. Various species "lists" are maintained by the U.S. Fish and Wildlife Service (USFWS), the U.S. Forest Service, and the State of California. There is considerable overlap between the species found on the State and Federal lists; however, neither list is identical.

Both the Federal Government and State of California maintain "threatened" and "endangered" species lists (as authorized by the Endangered Species Act of 1973 and California Endangered Species Act of 1984, respectively). Generally, a "threatened" species is one which is likely to become endangered within the foreseeable future. An "endangered" species is one whose prospects of survival and reproduction are in immediate jeopardy.

The Federal Government also maintains a list of "candidate species" which are species that, in the opinion of the USFWS may become threatened or endangered. The "candidate species" includes two categories; (1) those species which the USFWS has substantial information about to support the listing and (2) those species which the USFWS has inconclusive information about that is necessary to support a listing.

Management direction for Federally listed threatened and endangered species is in individual species recovery plans or local territory management plans. All projects in the vicinity of habitat essential to the survival of these species are evaluated for their potential effect on the species and/or its habitat. If necessary, modifications are made to the project to eliminate any possible negative impacts.

Many times the reason for the decline of a species is outside the control of the Forest Service. Migratory species, such as the bald eagle and peregrine falcon, and their prey species, were subjected to pesticide contamination after World War II. This contamination, from sources outside the Forests, led to their low population levels and eventual listing as endangered. Since the nationwide ban of DDT in 1972, populations of bald eagles and peregrine falcons have been increasing.

The State also maintains a list of "rare" plants, as authorized under the Native Plant Protection Act of 1977. These species are not threatened with extinction, but their numbers are so small that they may be endangered if their habitat is degraded. (Refer to the Botany Section.)

In addition to the Federal and State listed T&E species, the Pacific Southwest Region (Region 5) has designated certain animal and plant species as "sensitive." These include species requiring special management considerations due to low or unknown population numbers and/or the potential for their habitats to be degraded. State listed threatened, endangered, and rare species may also be included in this category. As new information becomes available, the sensitive species list is updated according to Forest Service direction.

Policy direction for sensitive species is to "implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions." The Regional Forester's "sensitive" species list includes 42 plants, 2 birds, 2 mammals, and 1 fish for the Shasta-Trinity National Forests. (Refer to Appendix G for a listing of threatened, endangered, and sensitive species found on the Forests).

Management Indicators

The management indicator approach is used to reduce the complexity of discussing all wildlife (some 370 species) on the Forests. Certain assemblages or groups of wildlife have been identified and selected as management indicators. These assemblages were chosen because: (1) they represent the vegetation types, seral stages, and special habitat elements necessary to provide for all wildlife species on the Forests; and (2) their population changes are believed to indicate or represent the effects of management activities on other wildlife populations.

Six of the Forests' threatened, endangered, and sensitive (TE&S) wildlife species have been selected as management indicators and will be discussed in more detail throughout the document. The management indicators that are not TE&S were discussed at the beginning of this section. **Table III-23** lists the TE&S species by category. Those categories are defined as follows:

Recovery Species -- Species identified for population increases because they are on a State or Federal threatened or endangered species list.

Species Habitat Indicators -- Species with specific and potentially limiting habitat requirements that may be significantly affected by Forest management activities (may include Forest Service sensitive species).

In addition to the above, the USFWS has identified seven category 2 species known to live in the Forests. These species include: (1) the California red-legged frog (Rana aurora draytoni); (2) Pacific western big-eared bat (Plecotus townsendii townsendii); (3) California wolverine (Gulo gulo luteus); (4) White-footed vole (Arborimus albipes); (5) Franklin's bumble bee (Bombus franklini); (6) Siskiyou ground beetle (Nebria gebleri siskiyouensis); and (7) the Klamath Mountains ground beetle (Nebria sahlbergii triad).

Other sensitive/State threatened species include the Sierra Nevada red fox (Vulpes vulpes necator), Shasta salamander (Hydromantes shastae),and the Trinity bristle snail (Monadenia setos). These species were not selected as management indicators, and, therefore, will not be discussed in this document.

1. Threatened

Northern Spotted Owl (NSO). The spotted owl was listed as a threatened species by the USFWS on July 23, 1990. The NSO prefers dense stands of mature, mixed conifer and Douglas-fir. However, recent surveys have indicated some variance in their habitat use. Habitat capability has been reduced through normal timber management practices. Because of the concern over viability for the NSO and other species which prefer this type of habitat, the NSO is an important species for management within the late seral stage assemblage.

Based on habitat capability estimates and increased inventory efforts, the Forests provide habitat for about 142 nest sites and/or reproductive pairs (1991). Timber type mapping indicates the potential may exist for additional nesting sites and/or breeding pairs. The potential exists to provide habitat for about 200 reproductive pairs over time.

Historically, because of other demands for the resources found in spotted owl habitat, special management considerations were needed to maintain species viability. In 1982, a network of 72 spotted owl habitat areas (SOHAs) was established for the NSO according to direction provided in the "Regional Guide for the Southwest Region." This network, approved by the Regional Office in January 1982, was spread across the Forests wherever existing habitat or potential habitat occurred within the species' native range. The network was tied in with adjacent Ranger Districts, National Forests, and Forest Service Regions from Washington to Northern California.

Table III-23
Threatened, Endangered and Sensitive Species

Species	Status		Category
Peregrine Falcon (Falco peregrinus)	FE	SE	Recovery Species
Bald Eagle (Haliaetus leucocephalus)	FE	SE	Recovery Species
Northern Spotted Owl (Strix Occidentalis)	FT		Recovery Species
Marbled Murrelet (Brachyramphus marmoratus)	FT		Recovery Species
Willow flycatcher (Empidonax trailii)	FS	ST	Species Habitat Indicator
Goshawk (Accipiter gentilis)	FS		Species Habitat Indicator
Pacific Fisher (Martes pennanti)	FC2	FS	Species Habitat Indicator
Marten (Martes americana)	FS		Species Habitat Indicator

FE = Federally listed endangered; FT = Federally listed threatened; FC2 = Federal candidate 2; FS = Federal sensitive; SE = State listed endangered; ST = State listed threatened.

Wherever possible, network sites were located where known pairs existed. SOHAs were placed to reduce as many potential conflicts with other resources as possible, while still meeting the needs of the owls (i.e. in wildernesses, riparian areas, research natural areas [RNAs], highly unstable areas, etc). Not all known spotted owl pairs and suitable owl habitats were placed in the network. The intent was to provide habitat "to support an adequate number of reproductive individuals and to distribute the habitat in such a way that those individuals could interact with others on the Forest(s)."

A major consideration was to manage for NSOs throughout their entire historic range. To do so it was necessary to establish some habitat areas in places where insufficient habitat existed because of checkerboard land ownership, environmental limitations on vegetation, past wildfires, or past management practices.

The Shasta-Trinity National Forests' matrix consisted of 72 SOHAs. The Forests' goal was to provide 1,000 acres of suitable owl habitat in each territory. Thirteen of the 72 matrix territories were unavailable for timber harvest (i.e., the existing Shasta Mud Flow RNA and five Wildernesses). Twelve matrix territories were unsuitable for timber production (i.e., inner gorges, wild rivers, the Shasta Unit of the NRA, and proposed RNAs). Twenty matrix territories had less than 2,000 acres of existing and potential habitat. Therefore, the only option which was considered on 1,000 acres of suitable habitat and 650 acres of replacement habitat on the above 45 matrix territories was no scheduled timber harvest. The remaining 27 matrix territories were managed for timber harvest.

The NSO was petitioned for listing in 1989. As a result, the Interagency Spotted Owl Scientific Committee (ISC) was established with the charge of developing a long-term management plan for the NSO. In May 1990 the final report, A Conservation Strategy for the Northern Spotted Owl (Thomas et al 1990), was released. This document determined that the SOHA management plan would be ineffective in providing long term viability for the species. Therefore, the Conservation Strategy developed habitat conservation areas (HCAs) centered around concentrations of known pairs and blocks of contiguous nesting/foraging habitat throughout the range of the species. Four different types of HCAs (categories 1, 2, 3 and 4) were identified and delineated. Each category of HCA was based on the number of existing and future expected pairs of owls. The Shasta-Trinity National Forests have all or portions of 22 category 1, 2, and mapped 3 HCAs containing approximately 529,800 acres of National Forest lands.

In addition, this strategy identified the need for linking blocks of habitat by maintaining vegetative attributes necessary for dispersal across the forest landscape. These dispersal attributes are referred to as the 50-11-40 rule. This rule establishes a quarter-township as the unit of analysis and states that "for every quarter-township, timber harvest shall be permitted only when 50 percent of the forest landscape consists of forest stands with a mean diameter at breast height (dbh) of 11 inches and a canopy closure of 40 percent".

In addition to the areas identified by the ISC Committee, the USFWS designated critical habitat for the NSO on January 15, 1992. While most of this habitat overlaps the previously identified HCAs, there were 121,509 additional acres identified outside of HCAs.

The Forest Service issued a Record of Decision for the Final Environmental Impact Statement (FEIS) on Management for the Northern Spotted Owl on March 3, 1992. The FEIS is being updated and amended as a result of a court order.

Currently, the USFWS is developing a Final Recovery Plan for the NSO. Both the Final Recovery Plan and the revised FEIS will be used by the Forests to guide management activities for the recovery of the species.

On September 28, 1990 the Chief of the Forest Service provided direction to vacate the Pacific Southwest Region's 1984 Regional Guidelines for management of the NSO habitat. The Chief's direction also indicated that "the Forest Service will conduct timber management activities in a manner not inconsistent with the Interagency Scientific Committee recommendations during this interim period."

Based on habitat capability models, it is estimated that there are about 311,000 acres of high and moderate suitable habitat on the Forests. (See **Figure III-9**.) This is defined by seral stages 4c and 4c-older using existing vegetative maps.

The Forest Service in California, Oregon, and Washington is involved in a research, development, and assessment (RD&A) program for spotted owls. In this program long-term research will identify, more precisely, the habitat needs of the NSO. In addition, the program identifies the need to thoroughly inventory all HCAs and develop management plans for each.

Spotted owls are closely associated with older over-mature forests, so in order to understand the owl, it is necessary to study its specific older over-mature habitat requirements. Studies of the owl's home range, habitat requirements, birth rates, dispersal, survival, and population-prey relationships are providing insight into the physical and biological characteristics needed to support this species.

Owl studies are also underway in second-growth stands to try and determine whether these stands can be silviculturally treated to make them suitable for owls. This

understanding can provide a basis for developing silvicultural approaches to timber management that maintain this older over-mature associated species and protect long-term timber production.

Marbled Murrelet. On September 28, 1992, the North American subspecies of the marbled murrelet (Brachyramphus marmoratus) was listed as a threatened species by the USFWS.

The marbled murrelet is a small sea bird of the Alcidae family. Its normal range extends from British Columbia, south through Washington, Oregon, and Central California.

Marbled murrelets feed primarily on fish and invertebrates near shore marine waters, and the majority of them are found within or adjacent to the marine environment.

They spend the majority of their lives on the ocean; however, they come inland to nest in larger, older trees. Some have been observed nesting inland up to 50 miles in Washington and up to 30 miles in Northern California.

Portions of the Trinity National Forest fall within 35-50 miles from the coast and have the potential to provide suitable nesting habitat. As of November 1, 1992, there had been no verified sightings and/or nests on the Forests.

2. Endangered

Bald Eagle. The bald eagle is listed as endangered by State and Federal Governments. Bald eagles in the Western United State are being managed under the guidelines of the Pacific Bald Eagle Recovery Plan (1986). The recovery plan divides the western states into 47 management zones with each zone assigned a recovery target based on capability and historic eagle distribution. The Shasta-Trinity falls within all or portions of three zones; California/Oregon Coast (zone 23), Shasta/Trinity (zone 24), and Pit River (zone 25).

Eagles are dependent on large lakes, reservoirs, and/or river systems. Most bald eagles found on the Forests are within the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) at Shasta and Trinity Lakes. Additional suitable habitat and active nesting territories exist on Siskiyou Lake, McCloud Reservoir, Iron Canyon Reservoir, Pit River, and the Trinity River.

It is estimated that up to 25 pair of bald eagles (25 percent of the breeding pairs in California) nest on the Forests. However, not all these pairs nest every year. Enough habitat exists for some expansion of these populations. The Forests' goal for the recovery effort of this species is 5 additional pair (for a total of 30). As new territories are discovered, territory plans are developed and the new sites are managed accordingly.

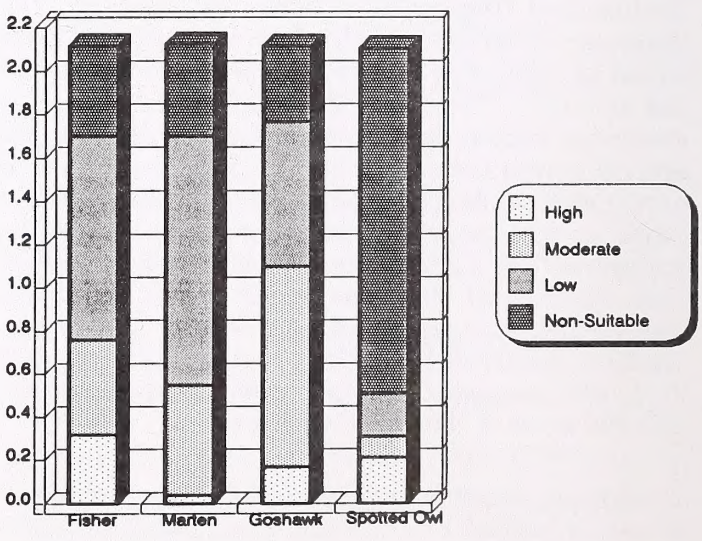
An administrative study has been initiated on the Forests to further help determine the habitat requirements of nesting bald eagles on Shasta and Trinity Lakes. This information will be the basis for developing a new bald eagle management plan for each lake. These plans will include all of the known existing territory sites plus any future potential sites.

From the information gathered so far it appears that the bald eagles which nest on the Forests do not migrate. There are no large wintering concentrations like there are in the Klamath Basin and selected reservoirs throughout California. However, the Papoose Arm of Trinity Lake, recognized by the State as a wintering area, has historically wintered about 30 eagles annually.

Peregrine Falcon. The peregrine falcon is both a State and Federally listed endangered species. Seven known nesting pair live within the Forests (1990). It is estimated that there is suitable habitat for an additional seven nesting pairs. However, no intensive survey has been completed for all potential nesting habitats. Based on 1990 survey data and a rapidly expanding Northern California interior mountains population, the Forests' capability is unknown but appears to be able to support about 14 pairs. Throughout California there are about 100 known nesting sites.

Peregrine falcons nest on cliffs. Most of the cliffs on the Forests have been located and rated for potential

Figure III-9
Suitable and Non-Suitable Habitat for Selected Sensitive Species (Million Acres)



occupancy (1979); however, only a few of these sites have been thoroughly surveyed. Outside of the breeding season the peregrine falcon migrates. Peregrine falcons banded on the Forests have been recovered as far south as Mexico.

The peregrine falcon receives full protection as delineated in individual nest territory plans. These plans carry out direction identified in a recovery plan for the peregrine falcon.

Habitat management for the peregrine falcon is applied mainly to the nest sites. As new nest sites are discovered, nest territory plans are written. Peregrine falcon management has, at times, impacted the timing of some projects, such as timber sales, but overall there has been very little impact on other resources. A primary concern is to protect the habitat area from disturbance during the breeding season.

Peregrine falcons on the Forests are monitored for nest occupancy and productivity. This monitoring is coordinated through an interagency Memorandum of Understanding with the BLM, the USFWS, the National Park Service, and the DFG.

3. Sensitive

Sensitive wildlife species on the Shasta-Trinity include the goshawk, marten, pacific fisher, and willow flycatcher. The amount of potentially high, moderate, and low suitability habitat is presented in **Figure III-9**.

Goshawk. The goshawk is designated as a sensitive species by Region 5. The goshawk can be found throughout the Forests in late and other successional stages of most conifer timber types. Most of the known sites on the Forests are on the McCloud Ranger District. Goshawk distribution and habitat use varies from the Trinity side to the Shasta side.

Current timber management practices may reduce the amount of available goshawk nesting habitat. Because of a concern to maintain viability of this species and others that depend on older over-mature timber for habitat, the goshawk has been selected as a representative in the late seral stage wildlife assemblage.

Based on the amount of mature and older over-mature habitat available, the Forests have sufficient habitat to support about 200+ nesting pairs and the potential to support over 250 pairs. Forest personnel provide protection for a 25-acre core area for each known nest site, plus, an additional alternate 25-acre core area. Additional restrictions may be placed on management activities within 1/2 mile of a nest. So far, this has not caused a significant economic impact, but as more sites are found the impact will increase.

Besides the minimum 50 acres per pair managed specifically for goshawks, additional habitat can be found in reserved areas (i.e. wildernesses) and other places managed for older over-mature habitat to meet diversity requirements.

Current information indicates that 200 acres of habitat may be necessary to maintain each nesting pair.

Marten. The marten is a close relative of the Pacific fisher and both belong to the mustelid family. It is partially diurnal (daytime) and is seen occasionally by Forest Service employees and visitors. The marten is also on Region 5's sensitive species list.

The marten is generally found on large, contiguous tracts of mature and over-mature mixed conifer, Douglas-fir, red fir and lodgepole pine above 4,000 feet. Red fir is the preferred vegetation type. There are about 95,950 acres of red fir on suitable and unsuitable land on the Forests. Existing data shows that there is a skewed distribution of martens on the Forests.

Marten sightings on the Trinity side appear to be isolated to the red fir zone while those on the Shasta side (north of Shasta Lake) are well distributed throughout many vegetation types. Based on habitat capability models, it is estimated that there are 590,000 acres of high and moderate suitable habitat (see **Figure III-9**). This is defined by seral stages 4b, 4c and 4c-older above 4,000 feet, using existing vegetative maps. Field verification of suitability will take place as part of the Forests' monitoring program.

Some segments of the public are concerned that the reduction and fragmentation of older over-mature habitat may jeopardize viability of the species. Because of this concern the marten has been selected as a representative in the late seral stage wildlife assemblage. Current management direction is based on the same strategy as the spotted owl. However, in order to provide linkage with the surrounding Forests, additional areas have been identified for special management consideration.

The marten is no longer trapped, and, therefore, no revenue is generated. The marten is another species that is provided for through management of diversity. Overall, the timber volume may be reduced by managing for some older over-mature habitat.

Pacific Fisher. The fisher is a Region 5 sensitive species and was petitioned for listing as a threatened species in 1990. Due to the lack of information about the Pacific fisher, the USFWS was unable to make a determination on its status. Therefore, it was classified as a category 2 species. It appears that the fisher prefers riparian, deciduous, and dense stands of many coniferous types.

It is a nocturnal and reclusive animal that few people have seen.

The fisher prefers large, contiguous tracts of mature and older over-mature mixed conifer, Douglas-fir, red fir, and in some areas lodgepole pine forests. Based on habitat capability models, it is estimated that there are 790,000 acres of high and moderate suitable habitat on the Forests. (See **Figure III-9**). This is defined by seral stages 4b,4c, and 4c-older using existing vegetative maps. Field verification of suitability will occur as part of the Shasta-Trinity's monitoring program.

Some segments of the public are concerned that management of habitat for spotted owls and other older over-mature habitat species may not be sufficient to maintain viable populations of the fisher. Because of this concern the fisher has been chosen as a representative of the late seral stage wildlife assemblage to gauge the effectiveness in managing for species dependent on mature and over-mature coniferous forests. The fisher could also be impacted by fragmentation of habitat.

Current management direction is to provide a diversity of habitats and habitat elements including special designated furbearer areas and to maintain five percent of the major timber types in wildlife habitat relationship's (WHRs) seral stage 4b and 4c, and another five percent in 4c-older (see Shasta-Trinity National Forests Supplement No. 1 to FSH 2409.24). In addition, the snag requirement is 2.5 snags per acre, with at least .3 snag over 24 inches dbh in emphasis areas and 1.5 snags per acre, with at least .3 snag over 24 inches dbh, in all other areas.

This direction, plus the implementation of A Conservation Strategy for the Northern Spotted Owl (HCAs, 50-11-40 rule, and critical habitat) and habitats found in other areas (e.g. wildernesses, riparian areas, unroaded non-motorized prescriptions) should provide for viability of the species. There are no constraints on other resources than those required for diversity/older over-mature requirements and the needs of other species which may have similar habitat requirements for all or part of their lifecycle.

It is no longer legal to trap fisher, so no revenue is generated from a consumptive standpoint.

Willow Flycatcher. The willow flycatcher is a Region 5 sensitive species and has been listed as threatened by the State of California. This species is associated with riparian woodland vegetation, primarily willow and alder, but is known to use upland shrub-type vegetation.

The willow flycatcher is a neotropical migrant normally arriving at breeding territory locations between late May and early June. It nests in willow thickets along the edge of streams, lake, ponds, and other wet areas throughout the Forests. Decreases in its population have been recognized throughout its range. These downward trends have been attributed to over grazing, flood control structures, development within the riparian zones, and nest parasitism by the brown-headed Cowbird (Molothrus ater).

Livestock grazing has the potential to impact this species, because livestock and the willow flycatcher both use the willow species. Where willow is present, livestock tend to browse the lower four feet of the willow plant. This is the same portion of the willow used for nesting by the willow flycatcher. Because of the concern to maintain viability of this species and others dependent on riparian habitat, the willow flycatcher has been selected as a representative in the riparian wildlife assemblage. Riparian ecosystems and willow flycatcher density and distribution will be monitored as part of the Forests' monitoring program.

4. Extirpated

Several wildlife species no longer exist on the Shasta-Trinity National Forests. These include the California grizzly bear (Ursus chelan), bighorn sheep (Ovis canadensis), and wolf (Canis lupis). The State Fish and Game Commission has no plans to reintroduce these species.

Management Opportunities

Future management goals for TE&S species will be directed towards (1) reaching viable populations in the case of T&E species; and (2) maintaining or, if possible, increasing existing viable populations of sensitive species.

Forest personnel will continue to survey for additional populations and habitats of TE&S species. Comprehensive surveys have begun for bald eagles, peregrine falcons, and NSOs. These surveys will intensify as management activities continue on the Forests. Additional inventory and/or surveys will be necessary to determine location, distribution, and habitat requisites of additional species and populations.

T&E species will continue to be managed under existing recovery goals identified in individual species recovery plans. Following is a brief discussion of the management options that exist for the Federally listed species known to inhabit the Shasta-Trinity:

Northern Spotted Owl. Opportunities exist to: (1) inventory and assess HCAs; (2) develop and implement HCA management plans; (3) develop silvicultural prescriptions commensurate with NSO habitat attributes; (4) monitor NSO habitat use within the managed forest landscape; and (5) create nesting habitat

through the development of snags where nesting habitat attributes are limited.

Marbled Murrelet. In the future there will be a need to survey the western side of the Trinity National Forest for the marbled murrelet. If discovered, appropriate action would be taken to provide for the recovery of the species and/or its habitat.

Sensitive species will continue to be managed so that viable populations will be maintained within the forest landscape. Opportunities exist to maintain and/or enhance habitat for the goshawk, marten, Pacific fisher, and willow flycatcher.

Bald Eagle. Opportunities for the bald eagle are to: (1) increase inventory efforts along the mainstem of the Trinity River; (2) provide additional nest groves adjacent to major bodies of water; (3) continue research on Trinity and Shasta Lakes to determine how nesting bald eagles interact with resource management activities; and (4) develop management plans for the long-term management on Trinity and Shasta Lakes.

Peregrine Falcon. Opportunities for this species are to: (1) increase interagency cooperation and coordination toward down and/or delisting; (2) update old inventory (1979) of habitat to determine habitat capability for the northern interior mountains; and (3) provide for enhancement of cliffs for additional peregrine nesting habitat.

Goshawk. Opportunities for the goshawk are to: (1) increase goshawk nest cores to 150 acres or larger with an additional alternate 50-acre nest cores (based on current information); (2) increase inventory and monitoring efforts across the Forests; (3) develop a goshawk habitat matrix; and (4) continue monitoring goshawk as part of the Forests' monitoring program.

Marten. Opportunities for the marten are to: (1) establish a habitat matrix to provide for continued viability of the species; (2) inventory, assess, and map habitat and population distribution; (3) develop silvicultural prescriptions for the managed landscape commensurate to marten habitat requisites; and (4) monitor marten as part of the Forests' ongoing program.

Pacific Fisher. Management opportunities are to: (1) establish a habitat matrix to provide for continued viability of the species; (2) inventory, assess, and map habitat and population distribution; (3) provide for administrative study to determine habitat use within the managed and unmanaged landscape; (4) develop silvicultural prescriptions for the managed landscape commensurate to fisher habitat requisites; and (5) monitor fisher as part of the Forests' monitoring program.

Willow Flycatcher. Management opportunities for the willow flycatcher are to: (1) inventory, assess, and map habitat and population distribution; (2) determine effects of management activities on the willow flycatcher; (3) re-establish willow stands around springs and seeps in the McCloud area to improve habitat; and (4) monitor willow flycatcher populations and/or habitat as part of the Forests' monitoring program.

Opportunities also exist to assess and map moderate to highly suitable habitat, to provide for the re-establishment of willow stands for willow flycatcher habitat, to develop denning and cover habitat for the Pacific fisher and marten, and to provide sufficient nesting habitat for nesting goshawks (i.e., 50-acre nest core, plus 50-acre alternate nest core). This assessment would take into account size, shape, and juxtaposition of habitat.

Managing wildlife habitats in accordance with capability models would provide for continued viability and ensure that none of the species become threatened or endangered because of Forest Service activities.

their diet. Current management direction is to maintain RMZs of 100 feet along perennial streams and lakes, and 50 feet along nonperennial streams and wetlands. The use of BMPs helps provide for water quality protection. Aquatic systems are also managed through fishery and riparian management.

Aquatic dependent wildlife rely on good water quality, adequate water quantity, riparian and forested cover, fish or aquatic insects, and large woody debris. These wildlife can be grouped within an aquatic wildlife assemblage. Some species represented by this assemblage are: tailed frog, western pond turtle, bald eagle, river otter and water shrew. A partnership with Duck's Unlimited can be established to manage areas for ducks, shorebirds and other aquatic dependent wildlife.

7. Hardwood Wildlife Assemblage

Hardwoods are found throughout the Forests either in pure stands or as individual trees in conifer forest types (see the Biological Diversity Section in this Chapter). Wildlife species use hardwoods for forage, nesting, and shelter. Acorn production from the oaks is especially important as a food source. Many hardwood species are found on sites that are unsuitable for management activities, so there is little likelihood they will be significantly altered by timber management practices. Some hardwoods, such as black oak, can be found on sites suitable for timber production.

Hardwoods are managed through diversity requirements. Where hardwoods exist in pure stands, current management direction is to retain most of the existing basal area per acre unless managing the stand for wildlife purposes. Where hardwoods occur naturally within existing conifer types, some hardwoods are retained.

Hardwoods have a high value to wildlife. With reduction of biomass in timber management, there is a need to monitor hardwoods and the wildlife species assemblage associated with them. Some species represented by this assemblage are: acorn woodpecker, scrub jay, evening grosbeak, white breasted nuthatch and Hutton's vireo.

8. Chaparral Wildlife Assemblage

Chaparral is the general name given to a diverse combination of shrubs that provide habitat for many wildlife species. Chaparral is maintained as a shrubland. It is also included within the early seral stage category. Through time, plantations cycle from the early seral stage to the later forested seral stages.

Chaparral habitat is important for a variety of wildlife. Many rodents inhabit chaparral, and deer and other herbivores find forage here. Chaparral can vary in elevation, and can provide winter range, summer range, escape cover and fawning areas for deer. The shrubs provide flowers, seeds, and leaves for birds in addition to providing cover and nest sites.

With chaparral and species habitat management, there is a need to monitor chaparral and the wildlife species in its assemblage. Some species represented by this assemblage are: bushtit, green-tailed towhee, wrentit, and mountain lion.

Prescribed burning of selected shrublands is the major form of chaparral management on the Forests. The majority of this work has been accomplished for the enhancement of forage for deer. Prescribed burning creates a mosaic that benefits many other species inhabiting the chaparral community.

9. Cliffs, Caves, Talus, and Rock Outcrops Wildlife Assemblage

Cliffs, caves, talus, and rock outcrops are geologic features that provide unique habitat for wildlife. These features provide nesting, denning, and shelter, and they are managed on a site-by-site basis. Some sites are considered as special features and are managed for their protection. Because of rough, broken terrain and less vegetation, these features are normally protected from change. For example, cliffs and talus are protected because they are avoided by construction activities. Some species represented by this assemblage are: Shasta salamander, canyon wren, peregrine falcon, and Townsend's big eared bat.

Economics: Supply and Demand

Current Supply-Demand Situation. Game species on the Forests provide hunting opportunities for local sport hunters from Klamath, Lassen, Modoc, Shasta, Siskiyou, Tehama, and Trinity Counties. Hunters from as far south as the Los Angeles Basin, as well as the states of Oregon and Nevada, also frequent the area. Expenditures by the sport hunting public are an important source of income for local businesses and contribute significantly to the economy of local counties.

There are an estimated 282,000 consumptive, wildlife user days (WUDs) on the Forests. In order of highest to lowest are: big game hunting, upland game, small game, trapping (furbearers), and waterfowl hunting. The estimated value of these WUDs is $16,474,000. Primary consumptive species are mule deer, black bear, quail, wild turkey, band-tailed pigeon, and gray squirrel.

Based on the total number of hunters and hunting licenses sold between 1981-1989, demand for consumptive

use in Northern California, for most of the above species, has steadily decreased at an average rate of 3 percent per year.

The demand for high quality (high success rates) deer hunting remains unfilled. This is evidenced by the number of hunters applying for special hunts in the north state. Also, the demand for turkey hunting is continuing to grow. Shasta County is the turkey hunting center for the State.

It is estimated that there are between 20,000 and 30,000 deer hunters on the Forests each year. Small and upland game hunters combined are estimated at 30,000. The total number of trappers is unknown, but proportioning out the reported harvest results in a value of $50,000 per year being taken in pelts of various furbearers.

Non-consumptive use and demand on the Forests nearly equals that of consumptive use. The monetary value, though, is much higher at $37,250,400. Current demand for non-consumptive species is primarily in the form of observation, nature study, photography, and so on. Bird watching is one of the most popular and widespread hobbies. There are many outdoor recreation and wildlife groups, based out of Redding and Mt. Shasta, that enjoy wildlife viewing and study on the Forests. With the current high use and expected increase in the use, there is a need to develop wildlife viewing sites and interpretation on the Forests.

Future Supply-Demand Situation. The demand for consumptive species (hunting, trapping, etc.) is expected to decrease. The 1990 RPA program predicts a six percent decline in big game hunting and a 17 percent decline in small game hunting. The demand for high quality (high success rate) deer hunting will continue.

The demand for non-consumptive use of wildlife species on the Shasta-Trinity National Forests is increasing at a faster rate than consumptive use and may result in protective legislation and allocation of habitats. Nationwide non-consumptive use is increasing significantly. The 1990 RPA program predicts an increase of over 150 percent in 50 years.

Management Opportunities

There are many opportunities to manage habitat and ecosystem diversity. Wildlife habitats are managed through project design, habitat improvements, protection, and mitigation. Wildlife habitats are also managed through application of standards and guidelines for riparian areas, snags, down logs, hardwoods, and seral stages, for example.

Several habitat improvements are needed on the Forests to benefit a variety of species. There is an opportunity to increase the viewing and hunting possibilities for the featured hunted species: deer, bear, elk and turkey. Water, as a drinking source, has a low availability and poor distribution, especially during a drought cycle. Guzzler installation, spring development, riparian improvements and closures can help meet drinking water needs. Prey and vegetative forage needs to be maintained or increased in chaparral, hardwood, and conifer forest communities. Prescribed fire or crushing of decadent browse, orchard pruning, oak thinning, etc. will improve food availablity, abundance, variety, and nutritional value.

Two emerging programs are the Watchable Wildlife and Neotropical Migrant Bird Programs. The Watchable Wildlife Program emphasizes increasing the access, interpretation, and education for public enjoyment of viewing, nature study, and photography of wildlife. The goal of the Neotropical Migrant Bird Program is to maintain, enhance, and restore declining populations of these birds. The need and opportunity exists to determine the status and possible causes of population changes of these migrant birds. Mapping habitat changes, bird banding, and breeding bird surveys will help determine the status and changes. There is also an opportunity to market the species, habitat, and program for Watchable Wildlife and Neotropical Migrant Birds. Creation of view sites, viewing pamphlets and brochures, news releases, magazine articles, local presentations, etc., can be used to promote the enjoyment of wildlife viewing and nature study opportunities. An opportunity exists to increase partnerships with civic, recreation, and conservation groups interested in these species.

Several funding sources are available for habitat management: program management funds, challenge cost share funds, partnership contributions and Knutsen-Vandenberg (KV) funds. The opportunity to manage habitat beneficially is increasing because of the increased emphasis on wildlife. Funding has increased in the challenge cost-share/partnership programs. Between $100,000 and $300,000 worth of work is being accomplished annually under the Forests' wildlife KV program.

There is also an opportunity to increase the wildlife habitat management program through increasing partnerships with other agencies and sports groups. Currently about 2,000 acres are receiving benefits from partnerships with private, state and Federal agencies. An additional 1,500 acres of direct habitat improvement (i.e., prescribed burns) and 5-10 structures (guzzlers, barricades, etc.) are also being constructed.

Even though there will be a decrease in the volume of timber harvested, there will remain a high need and opportunity for mitigation, enhancement, and protection. The need and opportunity to implement the deer

herd management goals and objectives will continue. The need and opportunity to implement the Trinity River basin wildlife management plan for riparian and upland habitats will also continue.

The potential exists to manage a substantially larger wildlife program on the Shasta-Trinity National Forests. The number of acres and structures completed annually could increase significantly over the present. There is an opportunity to stock other areas with elk and turkey transplants. With the growth of existing and stocked populations of elk and turkey, there will be an opportunity for increased viewing and hunting of these species. Along with elk, turkey, and deer, there is a need and opportunity to manage habitat (berry fields, down logs, den sites) for bear.

Wildlife habitat is affected not only by the amount of timber harvested, but by the type of harvest as well. The harvest effect on habitat successional stage may be either positive or negative depending upon the species habitat requirement. Opportunities exist to minimize the negative effects and to accentuate the positive through consideration of wildlife habitat requirements during compartment and project planning.

There are standards for maintaining later forest seral stages (including older over-mature habitat) for wildlife. There is an opportunity to design land allocations and prescriptions to benefit wildlife habitat, including older over-mature habitat associated species. Along with the current management allocations (wildernesses, wild and scenic rivers, research natural areas, and spotted owl conservation habitat areas) habitat for furbearers, larger riparian management zones, corridors, special interest areas and spotted owl dispersal can be managed for the benefit of the later seral stage habitat. There is also an opportunity to increase the standards for hardwood retention, snags and down log density, and the protection of meadows, wetlands and riparian areas for wildlife benefit.

Road construction is also a wildlife management concern. The effect of new roads is two-fold. First, there is a reduction of habitat as vegetation is removed for right-of-way clearing. Second is the increased use of the newly roaded area by recreationists. Recreation vehicle traffic and other dispersed recreation activities increase near the roads. Through consideration of wildlife habitat needs in planning for roads and through temporary or permanent closure of roads, negative impacts can be minimized. Road density needs to be decreased to lessen wildlife disturbance and harassment. Seasonal or permanent road closures and managing road traffic through design and maintenance can be done to decrease access. An opportunity exists to expand the McCloud Flats seasonal road closure onto private lands.

The developments on lands of intermingled ownerships within the Forests is another wildlife concern. Not only is there potential habitat loss from vegetation removal, but disturbances reduce the effectiveness of this land and the surrounding land as habitat. This is a particular concern with regards to deer herds. Availability of winter range is a limiting factor to deer herd size. When deer herd winter range is on private land that has potential for development, the biological potential becomes limited on National Forest land. Opportunities exist to lessen this impact through acquisition or exchange for lands that are key wildlife habitats.

There is a need to monitor the implementation and effectiveness of standards and guidelines, management prescriptions, projects, etc. The wildlife assemblages will be used as management indicators and some of them will be monitored. A monitoring and implementation plan is needed to guide the wildlife program accomplishments. There is a need to verify management assumptions, models, prescriptions, and concepts. Other opportunities and needs are to upgrade the Geographic Information System (GIS) technology and application, increase use of the ecosystem approach, gain additional data on species population levels and habitat conditions, and use an ecosystem approach for land stewardship.

Future management direction should reflect a need to maintain special habitats, habitat components, and distribution of habitats while maintaining viable populations of all wildlife species.

WILDLIFE (Threatened, Endangered, and Sensitive Species)

Public Issues

There is one public issue which focuses on threatened, endangered, and sensitive animals. It is:

How should the Forests' vegetative resources be managed for ecosystem diversity? Special consideration would be given to providing habitats that maintain or enhance populations of threatened and endangered (T&E) species and viable populations of sensitive species and/or management indicators. *(Public Issue #2)*

There is also one related public issue:

How much of the older vegetative seral stages existing on the Forests should be retained? *(Public Issue #3)*

Discussion of Public Issues

Nationwide there has been a reduction in certain fish, wildlife, and plant species due, in part, to pesticide contamination, excessive timber harvesting, reduction in water quality, and a reduction in the quantity and quality of available habitat. This reduction has resulted in placing certain species on Federal and/or State lists of threatened and endangered (T&E) species. The U.S. Forest Service has management authority only over those elements related to habitat alteration on National Forest lands.

Forest management activities can alter the amounts of available and suitable habitats such as older over-mature stands (old-growth) or special components of such stands (snags and dead/down material). In addition to direct alterations of habitat, the potential exists for indirect disturbance from noise and vehicle and people harassment.

Current Management Situation

Policy direction for the Forest Service is to manage "habitats for all existing native and desired nonnative plants, fish, and wildlife species in order to maintain viable populations of such species." Forest Service activities and programs are to assist in the recovery of T&E species and to avoid actions that may cause a species to become threatened or endangered.

State/Federal Lists. Various species "lists" are maintained by the U.S. Fish and Wildlife Service (USFWS), the U.S. Forest Service, and the State of California. There is considerable overlap between the species found on the State and Federal lists; however, neither list is identical.

Both the Federal Government and State of California maintain "threatened" and "endangered" species lists (as authorized by the Endangered Species Act of 1973 and California Endangered Species Act of 1984, respectively). Generally, a "threatened" species is one which is likely to become endangered within the foreseeable future. An "endangered" species is one whose prospects of survival and reproduction are in immediate jeopardy.

The Federal Government also maintains a list of "candidate species" which are species that, in the opinion of the USFWS may become threatened or endangered. The "candidate species" includes two categories; (1) those species which the USFWS has substantial information about to support the listing and (2) those species which the USFWS has inconclusive information about that is necessary to support a listing.

Management direction for Federally listed threatened and endangered species is in individual species recovery plans or local territory management plans. All projects in the vicinity of habitat essential to the survival of these species are evaluated for their potential effect on the species and/or its habitat. If necessary, modifications are made to the project to eliminate any possible negative impacts.

Many times the reason for the decline of a species is outside the control of the Forest Service. Migratory species, such as the bald eagle and peregrine falcon, and their prey species, were subjected to pesticide contamination after World War II. This contamination, from sources outside the Forests, led to their low population levels and eventual listing as endangered. Since the nationwide ban of DDT in 1972, populations of bald eagles and peregrine falcons have been increasing.

The State also maintains a list of "rare" plants, as authorized under the Native Plant Protection Act of 1977. These species are not threatened with extinction, but their numbers are so small that they may be endangered if their habitat is degraded. (Refer to the Botany Section.)

In addition to the Federal and State listed T&E species, the Pacific Southwest Region (Region 5) has designated certain animal and plant species as "sensitive." These include species requiring special management considerations due to low or unknown population numbers and/or the potential for their habitats to be degraded. State listed threatened, endangered, and rare species may also be included in this category. As new information becomes available, the sensitive species list is updated according to Forest Service direction.

Policy direction for sensitive species is to "implement management practices to ensure that species do not become threatened or endangered because of Forest Service actions." The Regional Forester's "sensitive" species list includes 42 plants, 2 birds, 2 mammals, and 1 fish for the Shasta-Trinity National Forests. (Refer to Appendix G for a listing of threatened, endangered, and sensitive species found on the Forests).

Management Indicators

The management indicator approach is used to reduce the complexity of discussing all wildlife (some 370 species) on the Forests. Certain assemblages or groups of wildlife have been identified and selected as management indicators. These assemblages were chosen because: (1) they represent the vegetation types, seral stages, and special habitat elements necessary to provide for all wildlife species on the Forests; and (2) their population changes are believed to indicate or represent the effects of management activities on other wildlife populations.

Six of the Forests' threatened, endangered, and sensitive (TE&S) wildlife species have been selected as management indicators and will be discussed in more detail throughout the document. The management indicators that are not TE&S were discussed at the beginning of this section. **Table III-23** lists the TE&S species by category. Those categories are defined as follows:

Recovery Species -- Species identified for population increases because they are on a State or Federal threatened or endangered species list.

Species Habitat Indicators -- Species with specific and potentially limiting habitat requirements that may be significantly affected by Forest management activities (may include Forest Service sensitive species).

In addition to the above, the USFWS has identified seven category 2 species known to live in the Forests. These species include: (1) the California red-legged frog (Rana aurora draytoni); (2) Pacific western big-eared bat (Plecotus townsendii townsendii); (3) California wolverine (Gulo gulo luteus); (4) White-footed vole (Arborimus albipes); (5) Franklin's bumble bee (Bombus franklini); (6) Siskiyou ground beetle (Nebria gebleri siskiyouensis); and (7) the Klamath Mountains ground beetle (Nebria sahlbergii triad).

Other sensitive/State threatened species include the Sierra Nevada red fox (Vulpes vulpes necator), Shasta salamander (Hydromantes shastae),and the Trinity bristle snail (Monadenia setos). These species were not selected as management indicators, and, therefore, will not be discussed in this document.

1. Threatened

Northern Spotted Owl (NSO). The spotted owl was listed as a threatened species by the USFWS on July 23, 1990. The NSO prefers dense stands of mature, mixed conifer and Douglas-fir. However, recent surveys have indicated some variance in their habitat use. Habitat capability has been reduced through normal timber management practices. Because of the concern over viability for the NSO and other species which prefer this type of habitat, the NSO is an important species for management within the late seral stage assemblage.

Based on habitat capability estimates and increased inventory efforts, the Forests provide habitat for about 142 nest sites and/or reproductive pairs (1991). Timber type mapping indicates the potential may exist for additional nesting sites and/or breeding pairs. The potential exists to provide habitat for about 200 reproductive pairs over time.

Historically, because of other demands for the resources found in spotted owl habitat, special management considerations were needed to maintain species viability. In 1982, a network of 72 spotted owl habitat areas (SOHAs) was established for the NSO according to direction provided in the "Regional Guide for the Southwest Region." This network, approved by the Regional Office in January 1982, was spread across the Forests wherever existing habitat or potential habitat occurred within the species' native range. The network was tied in with adjacent Ranger Districts, National Forests, and Forest Service Regions from Washington to Northern California.

Table III-23
Threatened, Endangered and Sensitive Species

Species	Status		Category
Peregrine Falcon (Falco peregrinus)	FE	SE	Recovery Species
Bald Eagle (Haliaetus leucocephalus)	FE	SE	Recovery Species
Northern Spotted Owl (Strix Occidentalis)	FT		Recovery Species
Marbled Murrelet (Brachyramphus marmoratus)	FT		Recovery Species
Willow flycatcher (Empidonax trailii)	FS	ST	Species Habitat Indicator
Goshawk (Accipiter gentilis)	FS		Species Habitat Indicator
Pacific Fisher (Martes pennanti)	FC2	FS	Species Habitat Indicator
Marten (Martes americana)	FS		Species Habitat Indicator

FE = Federally listed endangered; FT = Federally listed threatened; FC2 = Federal candidate 2; FS = Federal sensitive; SE = State listed endangered; ST = State listed threatened.

Wherever possible, network sites were located where known pairs existed. SOHAs were placed to reduce as many potential conflicts with other resources as possible, while still meeting the needs of the owls (i.e. in wildernesses, riparian areas, research natural areas [RNAs], highly unstable areas, etc). Not all known spotted owl pairs and suitable owl habitats were placed in the network. The intent was to provide habitat "to support an adequate number of reproductive individuals and to distribute the habitat in such a way that those individuals could interact with others on the Forest(s)."

A major consideration was to manage for NSOs throughout their entire historic range. To do so it was necessary to establish some habitat areas in places where insufficient habitat existed because of checkerboard land ownership, environmental limitations on vegetation, past wildfires, or past management practices.

The Shasta-Trinity National Forests' matrix consisted of 72 SOHAs. The Forests' goal was to provide 1,000 acres of suitable owl habitat in each territory. Thirteen of the 72 matrix territories were unavailable for timber harvest (i.e., the existing Shasta Mud Flow RNA and five Wildernesses). Twelve matrix territories were unsuitable for timber production (i.e., inner gorges, wild rivers, the Shasta Unit of the NRA, and proposed RNAs). Twenty matrix territories had less than 2,000 acres of existing and potential habitat. Therefore, the only option which was considered on 1,000 acres of suitable habitat and 650 acres of replacement habitat on the above 45 matrix territories was no scheduled timber harvest. The remaining 27 matrix territories were managed for timber harvest.

The NSO was petitioned for listing in 1989. As a result, the Interagency Spotted Owl Scientific Committee (ISC) was established with the charge of developing a long-term management plan for the NSO. In May 1990 the final report, A Conservation Strategy for the Northern Spotted Owl (Thomas et al 1990), was released. This document determined that the SOHA management plan would be ineffective in providing long term viability for the species. Therefore, the Conservation Strategy developed habitat conservation areas (HCAs) centered around concentrations of known pairs and blocks of contiguous nesting/foraging habitat throughout the range of the species. Four different types of HCAs (categories 1, 2, 3 and 4) were identified and delineated. Each category of HCA was based on the number of existing and future expected pairs of owls. The Shasta-Trinity National Forests have all or portions of 22 category 1, 2, and mapped 3 HCAs containing approximately 529,800 acres of National Forest lands.

In addition, this strategy identified the need for linking blocks of habitat by maintaining vegetative attributes necessary for dispersal across the forest landscape. These dispersal attributes are referred to as the 50-11-40 rule. This rule establishes a quarter-township as the unit of analysis and states that "for every quarter-township, timber harvest shall be permitted only when 50 percent of the forest landscape consists of forest stands with a mean diameter at breast height (dbh) of 11 inches and a canopy closure of 40 percent".

In addition to the areas identified by the ISC Committee, the USFWS designated critical habitat for the NSO on January 15, 1992. While most of this habitat overlaps the previously identified HCAs, there were 121,509 additional acres identified outside of HCAs.

The Forest Service issued a Record of Decision for the Final Environmental Impact Statement (FEIS) on Management for the Northern Spotted Owl on March 3, 1992. The FEIS is being updated and amended as a result of a court order.

Currently, the USFWS is developing a Final Recovery Plan for the NSO. Both the Final Recovery Plan and the revised FEIS will be used by the Forests to guide management activities for the recovery of the species.

On September 28, 1990 the Chief of the Forest Service provided direction to vacate the Pacific Southwest Region's 1984 Regional Guidelines for management of the NSO habitat. The Chief's direction also indicated that "the Forest Service will conduct timber management activities in a manner not inconsistent with the Interagency Scientific Committee recommendations during this interim period."

Based on habitat capability models, it is estimated that there are about 311,000 acres of high and moderate suitable habitat on the Forests. (See **Figure III-9.**) This is defined by seral stages 4c and 4c-older using existing vegetative maps.

The Forest Service in California, Oregon, and Washington is involved in a research, development, and assessment (RD&A) program for spotted owls. In this program long-term research will identify, more precisely, the habitat needs of the NSO. In addition, the program identifies the need to thoroughly inventory all HCAs and develop management plans for each.

Spotted owls are closely associated with older over-mature forests, so in order to understand the owl, it is necessary to study its specific older over-mature habitat requirements. Studies of the owl's home range, habitat requirements, birth rates, dispersal, survival, and population-prey relationships are providing insight into the physical and biological characteristics needed to support this species.

Owl studies are also underway in second-growth stands to try and determine whether these stands can be silviculturally treated to make them suitable for owls. This

understanding can provide a basis for developing silvicultural approaches to timber management that maintain this older over-mature associated species and protect long-term timber production.

Marbled Murrelet. On September 28, 1992, the North American subspecies of the marbled murrelet (Brachyramphus marmoratus) was listed as a threatened species by the USFWS.

The marbled murrelet is a small sea bird of the Alcidae family. Its normal range extends from British Columbia, south through Washington, Oregon, and Central California.

Marbled murrelets feed primarily on fish and invertebrates near shore marine waters, and the majority of them are found within or adjacent to the marine environment.

They spend the majority of their lives on the ocean; however, they come inland to nest in larger, older trees. Some have been observed nesting inland up to 50 miles in Washington and up to 30 miles in Northern California.

Portions of the Trinity National Forest fall within 35-50 miles from the coast and have the potential to provide suitable nesting habitat. As of November 1, 1992, there had been no verified sightings and/or nests on the Forests.

2. Endangered

Bald Eagle. The bald eagle is listed as endangered by State and Federal Governments. Bald eagles in the Western United State are being managed under the guidelines of the Pacific Bald Eagle Recovery Plan (1986). The recovery plan divides the western states into 47 management zones with each zone assigned a recovery target based on capability and historic eagle distribution. The Shasta-Trinity falls within all or portions of three zones; California/Oregon Coast (zone 23), Shasta/Trinity (zone 24), and Pit River (zone 25).

Eagles are dependent on large lakes, reservoirs, and/or river systems. Most bald eagles found on the Forests are within the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) at Shasta and Trinity Lakes. Additional suitable habitat and active nesting territories exist on Siskiyou Lake, McCloud Reservoir, Iron Canyon Reservoir, Pit River, and the Trinity River.

It is estimated that up to 25 pair of bald eagles (25 percent of the breeding pairs in California) nest on the Forests. However, not all these pairs nest every year. Enough habitat exists for some expansion of these populations. The Forests' goal for the recovery effort of this species is 5 additional pair (for a total of 30). As new territories are discovered, territory plans are developed and the new sites are managed accordingly.

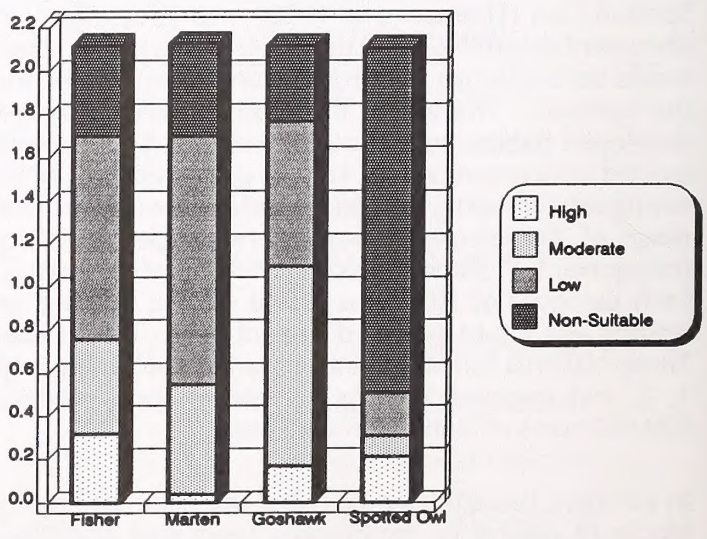
An administrative study has been initiated on the Forests to further help determine the habitat requirements of nesting bald eagles on Shasta and Trinity Lakes. This information will be the basis for developing a new bald eagle management plan for each lake. These plans will include all of the known existing territory sites plus any future potential sites.

From the information gathered so far it appears that the bald eagles which nest on the Forests do not migrate. There are no large wintering concentrations like there are in the Klamath Basin and selected reservoirs throughout California. However, the Papoose Arm of Trinity Lake, recognized by the State as a wintering area, has historically wintered about 30 eagles annually.

Peregrine Falcon. The peregrine falcon is both a State and Federally listed endangered species. Seven known nesting pair live within the Forests (1990). It is estimated that there is suitable habitat for an additional seven nesting pairs. However, no intensive survey has been completed for all potential nesting habitats. Based on 1990 survey data and a rapidly expanding Northern California interior mountains population, the Forests' capability is unknown but appears to be able to support about 14 pairs. Throughout California there are about 100 known nesting sites.

Peregrine falcons nest on cliffs. Most of the cliffs on the Forests have been located and rated for potential oc-

Figure III-9
Suitable and Non-Suitable Habitat for Selected Sensitive Species (Million Acres)



cupancy (1979); however, only a few of these sites have been thoroughly surveyed. Outside of the breeding season the peregrine falcon migrates. Peregrine falcons banded on the Forests have been recovered as far south as Mexico.

The peregrine falcon receives full protection as delineated in individual nest territory plans. These plans carry out direction identified in a recovery plan for the peregrine falcon.

Habitat management for the peregrine falcon is applied mainly to the nest sites. As new nest sites are discovered, nest territory plans are written. Peregrine falcon management has, at times, impacted the timing of some projects, such as timber sales, but overall there has been very little impact on other resources. A primary concern is to protect the habitat area from disturbance during the breeding season.

Peregrine falcons on the Forests are monitored for nest occupancy and productivity. This monitoring is coordinated through an interagency Memorandum of Understanding with the BLM, the USFWS, the National Park Service, and the DFG.

3. Sensitive

Sensitive wildlife species on the Shasta-Trinity include the goshawk, marten, pacific fisher, and willow flycatcher. The amount of potentially high, moderate, and low suitability habitat is presented in **Figure III-9**.

Goshawk. The goshawk is designated as a sensitive species by Region 5. The goshawk can be found throughout the Forests in late and other successional stages of most conifer timber types. Most of the known sites on the Forests are on the McCloud Ranger District. Goshawk distribution and habitat use varies from the Trinity side to the Shasta side.

Current timber management practices may reduce the amount of available goshawk nesting habitat. Because of a concern to maintain viability of this species and others that depend on older over-mature timber for habitat, the goshawk has been selected as a representative in the late seral stage wildlife assemblage.

Based on the amount of mature and older over-mature habitat available, the Forests have sufficient habitat to support about 200+ nesting pairs and the potential to support over 250 pairs. Forest personnel provide protection for a 25-acre core area for each known nest site, plus, an additional alternate 25-acre core area. Additional restrictions may be placed on management activities within 1/2 mile of a nest. So far, this has not caused a significant economic impact, but as more sites are found the impact will increase.

Besides the minimum 50 acres per pair managed specifically for goshawks, additional habitat can be found in reserved areas (i.e. wildernesses) and other places managed for older over-mature habitat to meet diversity requirements.

Current information indicates that 200 acres of habitat may be necessary to maintain each nesting pair.

Marten. The marten is a close relative of the Pacific fisher and both belong to the mustelid family. It is partially diurnal (daytime) and is seen occasionally by Forest Service employees and visitors. The marten is also on Region 5's sensitive species list.

The marten is generally found on large, contiguous tracts of mature and over-mature mixed conifer, Douglas-fir, red fir and lodgepole pine above 4,000 feet. Red fir is the preferred vegetation type. There are about 95,950 acres of red fir on suitable and unsuitable land on the Forests. Existing data shows that there is a skewed distribution of martens on the Forests.

Marten sightings on the Trinity side appear to be isolated to the red fir zone while those on the Shasta side (north of Shasta Lake) are well distributed throughout many vegetation types. Based on habitat capability models, it is estimated that there are 590,000 acres of high and moderate suitable habitat (see **Figure III-9**). This is defined by seral stages 4b, 4c and 4c-older above 4,000 feet, using existing vegetative maps. Field verification of suitability will take place as part of the Forests' monitoring program.

Some segments of the public are concerned that the reduction and fragmentation of older over-mature habitat may jeopardize viability of the species. Because of this concern the marten has been selected as a representative in the late seral stage wildlife assemblage. Current management direction is based on the same strategy as the spotted owl. However, in order to provide linkage with the surrounding Forests, additional areas have been identified for special management consideration.

The marten is no longer trapped, and, therefore, no revenue is generated. The marten is another species that is provided for through management of diversity. Overall, the timber volume may be reduced by managing for some older over-mature habitat.

Pacific Fisher. The fisher is a Region 5 sensitive species and was petitioned for listing as a threatened species in 1990. Due to the lack of information about the Pacific fisher, the USFWS was unable to make a determination on its status. Therefore, it was classified as a category 2 species. It appears that the fisher prefers riparian, deciduous, and dense stands of many coniferous types.

It is a nocturnal and reclusive animal that few people have seen.

The fisher prefers large, contiguous tracts of mature and older over-mature mixed conifer, Douglas-fir, red fir, and in some areas lodgepole pine forests. Based on habitat capability models, it is estimated that there are 790,000 acres of high and moderate suitable habitat on the Forests. (See **Figure III-9**). This is defined by seral stages 4b,4c, and 4c-older using existing vegetative maps. Field verification of suitability will occur as part of the Shasta-Trinity's monitoring program.

Some segments of the public are concerned that management of habitat for spotted owls and other older over-mature habitat species may not be sufficient to maintain viable populations of the fisher. Because of this concern the fisher has been chosen as a representative of the late seral stage wildlife assemblage to gauge the effectiveness in managing for species dependent on mature and over-mature coniferous forests. The fisher could also be impacted by fragmentation of habitat.

Current management direction is to provide a diversity of habitats and habitat elements including special designated furbearer areas and to maintain five percent of the major timber types in wildlife habitat relationship's (WHRs) seral stage 4b and 4c, and another five percent in 4c-older (see Shasta-Trinity National Forests Supplement No. 1 to FSH 2409.24). In addition, the snag requirement is 2.5 snags per acre, with at least .3 snag over 24 inches dbh in emphasis areas and 1.5 snags per acre, with at least .3 snag over 24 inches dbh, in all other areas.

This direction, plus the implementation of A Conservation Strategy for the Northern Spotted Owl (HCAs, 50-11-40 rule, and critical habitat) and habitats found in other areas (e.g. wildernesses, riparian areas, unroaded non-motorized prescriptions) should provide for viability of the species. There are no constraints on other resources than those required for diversity/older over-mature requirements and the needs of other species which may have similar habitat requirements for all or part of their lifecycle.

It is no longer legal to trap fisher, so no revenue is generated from a consumptive standpoint.

Willow Flycatcher. The willow flycatcher is a Region 5 sensitive species and has been listed as threatened by the State of California. This species is associated with riparian woodland vegetation, primarily willow and alder, but is known to use upland shrub-type vegetation.

The willow flycatcher is a neotropical migrant normally arriving at breeding territory locations between late May and early June. It nests in willow thickets along the edge of streams, lake, ponds, and other wet areas throughout the Forests. Decreases in its population have been recognized throughout its range. These downward trends have been attributed to over grazing, flood control structures, development within the riparian zones, and nest parasitism by the brown-headed Cowbird (Molothrus ater).

Livestock grazing has the potential to impact this species, because livestock and the willow flycatcher both use the willow species. Where willow is present, livestock tend to browse the lower four feet of the willow plant. This is the same portion of the willow used for nesting by the willow flycatcher. Because of the concern to maintain viability of this species and others dependent on riparian habitat, the willow flycatcher has been selected as a representative in the riparian wildlife assemblage. Riparian ecosystems and willow flycatcher density and distribution will be monitored as part of the Forests' monitoring program.

4. Extirpated

Several wildlife species no longer exist on the Shasta-Trinity National Forests. These include the California grizzly bear (Ursus chelan), bighorn sheep (Ovis canadensis), and wolf (Canis lupis). The State Fish and Game Commission has no plans to reintroduce these species.

Management Opportunities

Future management goals for TE&S species will be directed towards (1) reaching viable populations in the case of T&E species; and (2) maintaining or, if possible, increasing existing viable populations of sensitive species.

Forest personnel will continue to survey for additional populations and habitats of TE&S species. Comprehensive surveys have begun for bald eagles, peregrine falcons, and NSOs. These surveys will intensify as management activities continue on the Forests. Additional inventory and/or surveys will be necessary to determine location, distribution, and habitat requisites of additional species and populations.

T&E species will continue to be managed under existing recovery goals identified in individual species recovery plans. Following is a brief discussion of the management options that exist for the Federally listed species known to inhabit the Shasta-Trinity:

Northern Spotted Owl. Opportunities exist to: (1) inventory and assess HCAs; (2) develop and implement HCA management plans; (3) develop silvicultural prescriptions commensurate with NSO habitat attributes; (4) monitor NSO habitat use within the managed forest landscape; and (5) create nesting habitat

through the development of snags where nesting habitat attributes are limited.

Marbled Murrelet. In the future there will be a need to survey the western side of the Trinity National Forest for the marbled murrelet. If discovered, appropriate action would be taken to provide for the recovery of the species and/or its habitat.

Sensitive species will continue to be managed so that viable populations will be maintained within the forest landscape. Opportunities exist to maintain and/or enhance habitat for the goshawk, marten, Pacific fisher, and willow flycatcher.

Bald Eagle. Opportunities for the bald eagle are to: (1) increase inventory efforts along the mainstem of the Trinity River; (2) provide additional nest groves adjacent to major bodies of water; (3) continue research on Trinity and Shasta Lakes to determine how nesting bald eagles interact with resource management activities; and (4) develop management plans for the long-term management on Trinity and Shasta Lakes.

Peregrine Falcon. Opportunities for this species are to: (1) increase interagency cooperation and coordination toward down and/or delisting; (2) update old inventory (1979) of habitat to determine habitat capability for the northern interior mountains; and (3) provide for enhancement of cliffs for additional peregrine nesting habitat.

Goshawk. Opportunities for the goshawk are to: (1) increase goshawk nest cores to 150 acres or larger with an additional alternate 50-acre nest cores (based on current information); (2) increase inventory and monitoring efforts across the Forests; (3) develop a goshawk habitat matrix; and (4) continue monitoring goshawk as part of the Forests' monitoring program.

Marten. Opportunities for the marten are to: (1) establish a habitat matrix to provide for continued viability of the species; (2) inventory, assess, and map habitat and population distribution; (3) develop silvicultural prescriptions for the managed landscape commensurate to marten habitat requisites; and (4) monitor marten as part of the Forests' ongoing program.

Pacific Fisher. Management opportunities are to: (1) establish a habitat matrix to provide for continued viability of the species; (2) inventory, assess, and map habitat and population distribution; (3) provide for administrative study to determine habitat use within the managed and unmanaged landscape; (4) develop silvicultural prescriptions for the managed landscape commensurate to fisher habitat requisites; and (5) monitor fisher as part of the Forests' monitoring program.

Willow Flycatcher. Management opportunities for the willow flycatcher are to: (1) inventory, assess, and map habitat and population distribution; (2) determine effects of management activities on the willow flycatcher; (3) re-establish willow stands around springs and seeps in the McCloud area to improve habitat; and (4) monitor willow flycatcher populations and/or habitat as part of the Forests' monitoring program.

Opportunities also exist to assess and map moderate to highly suitable habitat, to provide for the re-establishment of willow stands for willow flycatcher habitat, to develop denning and cover habitat for the Pacific fisher and marten, and to provide sufficient nesting habitat for nesting goshawks (i.e., 50-acre nest core, plus 50-acre alternate nest core). This assessment would take into account size, shape, and juxtaposition of habitat.

Managing wildlife habitats in accordance with capability models would provide for continued viability and ensure that none of the species become threatened or endangered because of Forest Service activities.

CHAPTER IV

Environmental Consequences

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CHAPTER IV
Environmental Consequences

Introduction
A

This Chapter describes the environmental consequences of implementing the four alternatives discussed in Chapter II (Individual Alternative Descriptions.) The discussions center around what would change, how much, and why. This chapter is also the basis for the comparison of alternatives displayed in Chapter II, Part F. A summary of the environmental consequences, by alternative, is included in Chapter II, **Table II-27.**

Chapter III, Affected Environment, describes the situation and conditions which exist in the planning area. It provides the basis for understanding the consequences of implementing the proposed Forest Plan or its alternatives. Chapters III and IV lead to an understanding of the environment that would be created as a result of implementing any of the alternatives. The environment to be created for each alternative is discussed in Chapter II under the individual alternatives.

Environmental consequences, commonly called impacts or effects, result from applying various combinations of management prescriptions. The different mix of prescriptions in each alternative produces different levels of resource outputs, goods, and services. These, in turn, cause different affects on the quality of the environment. In other words, the level of output attained, the land base from which it is produced, and the intensity with which management practices are applied, translate into varying environmental consequences for each alternative. No extreme environmental consequences would result from implementing any of these alternatives. This is assured by the inclusion of Forest Standards and Guidelines in all alternatives. They mitigate adverse impacts and ensure long-term productivity of the land.

Economic Consequences
B

Comparisons between alternatives for all major economic effects are summarized in several tables in Chapter II. The modeling and analysis assumptions behind these estimates of effects are described in Appendix B. The effects of each alternative on present net value (PNV), county receipts, employment, income, and the Forest budget were chosen for display in this chapter (See **Table IV-1**).

Present Net Value (PNV). PNV is a measure of relative economic scale and efficiency. All future costs and benefits of each alternative were discounted to the 1989 base period. The difference between discounted benefits and discounted costs is the PNV. This discounting of values to a common period makes possible a comparison of benefits and costs that occur at different times.

Subject to each alternative's unique set of constraints, the Forest Planning Model (FORPLAN) allocated land uses and scheduled activities to maximize PNV.

County Receipts. Returns are distributed back to four counties (Shasta, Siskiyou, Trinity, and Tehama), in the amount of 25 percent to help finance roads and school budgets. The majority of these payments come from the value of harvested timber. Additional payments come from land use permits, grazing fees, recreation permits, and user fees.

Income and Employment. The production of goods and services from the National Forests affects the economy of the local area by generating income and employment. To measure this effect, an input/output model was used to develop income and employment multipliers (see Appendix B for details). The results shown in **Table IV-1** include direct, indirect and induced income and employment. Timber harvest, recreation visitor days, wildlife and fish user days, total expenditures, and grazing animal months are the driving forces in generating income and employment.

Forest Budget. The Forest budget consists of the total annual cost of managing the Shasta-Trinity National Forests under each alternative excluding the cost of fighting fires and cooperative funds. A substantial portion of the budget enters the local economy.

By order of importance the variation of PNV by alternative occurs for the following reasons: (1) the amount of timber harvested; (2) the percent of full versus low standard visitor days of recreation; (3) the number of wildlife and fish user days; and (4) the amount of water produced. Receipts to counties, employment, income, and budget vary primarily as a function of timber harvested. The economic difference between alternatives is minimal due to the constraints on the land base. Previous draft plans with a much larger tentatively suitable land base allowed for much larger variations in the economic consequences of the alternatives. See Chapter II, Economic Comparisons, for more information on why and how these outputs vary by alternative.

A discussion of the economic consequences by alternative follows. Since timber outputs are significantly reduced from historic levels, county receipts and employment levels are also reduced. PNV, income, and

the Forest budget have not decreased proportionately due to increases in unit values of outputs.

Alternative PRF (Preferred Alternative)

PNV ranks third highest when compared to all four alternatives. PNV is lower than Alternative CUR. Reduced timber harvest and associated revenue is the primary reason why.

County receipts and employment and income are the third highest when compared to the other alternatives. These outputs are all lower than Alternative CUR because of lower timber harvest.

The Forest budget is the highest among all the alternatives. This budget is higher than Alternative CUR because of increased timber associated costs.

Alternative RPA (1990 Program Emphasis)

PNV is the highest of all alternatives. The highest timber harvest level and an emphasis on dispersed high standard recreation are the primary reasons why this alternative has an increase over Alternative CUR.

County receipts and employment and income are the highest when compared to the other alternatives. This is a reflection of the high timber harvest level.

The Forest budget is the second highest among all the alternatives. The budget is higher than Alternative CUR because of increases in the timber, recreation, wildlife, and water programs.

Alternative CUR (No Action/No Change)

PNV ranks second when compared to the other alternatives. The emphasis on low standard recreation and meeting only 75 percent of the demand for developed and wilderness recreation after decade 2 is the primary reason for the lower PNV.

County receipts and employment and income are the second highest when compared to the other alternatives. This is because this alternative has the second highest timber harvest level.

The Forest budget is the second lowest among the alternatives during the first decade. This is a reflection of the high timber harvest level and the low recreation, wildlife, and water programs.

Alternative CBF (Citizens for Better Forestry)

PNV ranks fourth when comparing the four alternatives. PNV is lower than Alternative CUR. This alternative has the same recreation and fire program as Alternative PRF. However, the smaller suitable timber base, lower timber

Table IV-1
Comparison of Economic Effects - First Decade
(Percent Indicates Relationship to Alternative CUR)

	PRF	RPA	CUR	CBF
Present Net Value				
(MM$* - 1989)	8,234	8,469	8,239	8,128
(percent)	0	+3	0	-1
Annual County Receipts				
(MM$ - 1989)	5	8	7	4
(percent)	-29	+14	0	-43
Annual Employment				
(Jobs)	3,633	3,888	3,682	3,208
(percent)	-1	+6	0	-13
Annual Income				
(MM$ - 1989)	138	148	140	122
(percent)	-1	+6	0	-13
Annual Forest Budget				
(MM$ - 1989)	43	43	40	38
(percent)	+8	+8	0	-5

* MM$ = million dollars

harvest, emphasis on less intensive timber practices, and longer rotation ages result in a lower PNV than Alternatives PRF and CUR.

County receipts and employment and income are the lowest when compared to the other alternatives. These outputs are all lower than Alternative CUR because of the lower timber cut.

The Forest budget is the lowest among the alternatives during the first decade. This budget is lower than Alternative CUR because the reduced timber program lowers the budget more than the higher recreation and wildlife programs increase the budget.

Social Consequences

C

Overview. Chapter III identified the social groups most likely to be affected by the different outputs, land allocations, and management practices associated with the alternatives shown in Chapter II. It also described the basic characteristics of the social groups and their linkages to the Forests. These social groups are categories of people who share the same interests and concerns. They are not mutually exclusive, and individuals may be included in more than one group or none of the categorized groups. The social groups identified are: resource utilization emphasis, resource amenity emphasis, recreationists, and Native Americans. This chapter displays the social effects of the alternatives on these groups. It is assumed that these groups include minorities, women, handicapped, elderly, those for whom English is a second language, and those of different ethnic origins.

Minority groups may not be affected any differently as special groups than they would be as a part of one of the social groups discussed in Chapter III. Shasta-Trinity National Forests' personnel are committed to giving equal treatment to all individuals and social groups, including minorities, women, handicapped, elderly, and English as a second language groups in providing services, opportunities, and jobs. None of the alternatives has discriminating effects.

The alternatives do, however, raise social issues. When two or more groups within the Forests' sphere of influence differ significantly in their expectations for resource use, and when the alternatives have different effects on the social groups, there is a potential for conflict.

There are generally ways to resolve or reduce the conflict if adequate social information is available. Thus, social analysis is a major part of the Forests' planning process. Four social variables are used in determining the social consequences of implementing the alternatives. These variables are (1) lifestyles, (2) attitudes, beliefs, and values, (3) social organization, and (4) population. These social variables are defined in Chapter III, Part D. **Table IV-2** is a simplified summary of the effects alternatives have on social group variables. It may aid in understanding the discussion of each alternative which follows.

Consequences Specific to an Alternative

Alternative PRF (Preferred Alternative)

Timber harvests have decreased significantly for all alternatives when compared with historic levels. There is a relative difference between alternatives, but because of the low level of output common to all alternatives, the social effects are similar.

Timber outputs would be about 82 percent of Alternative CUR and 40 percent of historic levels. Groups linked economically to the Forests' outputs would benefit slightly less than under Alternative CUR. Opportunities for recreationists would be enhanced moderately.

Expectations of persons in favor of preservation values would likely be supported by the amounts of wilderness designated by recent legislation, dispersed recreation opportunities, and protection of scenic resources.

There would be a change to population and land use from the mix of resource outputs associated with this alternative. Direct, indirect and induced employment, dependent on timber outputs from the National Forest, would be reduced from historic levels.

Alternative RPA (1990 RPA Program Emphasis)

Implementation of this alternative would produce the highest level of timber outputs of all the alternatives. However, timber outputs would only be about 50 percent of the average level sold over the past 13 years. This would result in a reduction in employment for those groups dependent on the forest products industries.

Recreation opportunities would be enhanced. The reduced emphasis on timber harvest would cause an increased land base for recreation and other amenity resource opportunities. This increase would be noticed most by recreationists, amenity emphasis groups, and Native Americans. This alternative would produce the highest market outputs of all the alternatives. It would have the lowest negative impact to the lifestyle stability of people linked economically to natural resources.

The outputs of this alternative would be the most growth inducing of all the alternatives. Although, since timber outputs are significantly lower than historic levels, this alternative would actually have negative impacts to population growth rates as compared with historic levels.

Table IV-2
Effects of Alternatives on Social Group Variables

	ALTERNATIVE			
	PRF	RPA	CUR	CBF
Lifestyles				
Resource Utilization Emphasis	Little Support	Most Supports	Supports	Least Supports
Resource Amenity Emphasis	Substantially Supports	Supports	Supports	Most Supports
Recreationists	Substantially Supports	Supports	Supports	Substantially Supports
Native Americans	Mixed Support	Mixed Support	Mixed Support	Mixed Support
Attitudes, Beliefs, and Values				
Resource Utilization Emphasis	Coincides Least With	Coincides Least With	Coincides Least With	Coincides Least With
Resource Amenity Emphasis	Substantially Coincides With	Coincides With	Coincides With	Coincides Most With
Recreationists	Substantially Coincides With	Coincides With	Coincides With	Substantially Coincides With
Native Americans	Coincides With	Coincides With	Coincides With	Coincides With
Community Stability and Cohesion*				
Resource Utilization Emphasis	Less Stable	Stable	Stable	Least Stable
Resource Amenity Emphasis	Stable	Less Stable	Stable	Most Stable
Recreationists	N/A	N/A	N/A	N/A
Native Americans	Stable	Less Stable	Stable	Stable
Population Service Needs				
Resource Utilization Emphasis Resource Amenity Emphasis Recreationists Native Americans	--------- All Alternatives - Little Change			

* The community is generally the most stable and cohesive under Alternative CUR, since the Forest Service outputs would not be growth inducing. There would be considerable new economic growth, but it would be from sources other than the Forest Service. The alternatives which are more growth inducing or cause an economic reversal would offer less community stability and cohesion.

Alternative CUR (No Action/No Change)

Under Alternative CUR continuing management direction would have a negative impact on groups employed in and those dependent on traditional forest products industries. Actual harvest levels, rather than external market factors, would begin to play a greater role on National Forest lands. Existing recreation opportunities would continue, especially hunting, fishing, and boating activities.

In the short term, most social groups would feel negative impacts from greater community instability since the reduced Forest Service outputs would be growth curtailing. There would probably be new economic growth, but it would be from sources other than the Forest Service.

Alternative CBF (Citizens for Better Forestry)

Recreationists and amenity emphasis groups would benefit from the increased recreation opportunities which emphasize their attitudes and values. Amenity emphasis groups and Native Americans would benefit from the emphasis on less development and more dispersed recreation opportunities such as hunting and fishing. Native Americans employed in the forest products industry would be adversely affected.

The lifestyles and values of recreationists and amenity emphasis groups would be recognized by less intensive (long rotation) management. This would result in the least disturbance of esthetic resources (visual quality and recreation opportunities). However, due to the constraints on the land base the total difference from all other alternatives is minimal.

Lower timber outputs, about 28 percent of historic levels, would be detrimental to most groups, especially those people economically linked to the Forests. This alternative would deter economic growth the most due to changes in land use from timber to non-timber uses. A loss of community stability and cohesion would result from a greater out-migration of timber workers. Some unemployment problems would be softened by other new sources of economic growth such as recreation.

Resource Consequences

D

This section discusses, for each of the Forests' resources, the environmental impacts which would result from implementation of any of the four alternatives considered in detail in this Draft EIS. These impacts are discussed on the basis of direct and indirect effects, short-term uses versus long-term productivity, and irreversible or irretrievable commitments of resources.

Each resource is also discussed from the standpoint of:

--Consequences which do not vary or are common to all alternatives; and

--Consequences which vary among alternatives and/or are unique or specific to a given alternative.

Outputs and changes in conditions are estimated into the future, and the differences between alternatives are displayed. Analyses and detail on the means of estimating the effects of each alternative are included in the planning records on file in the Forest Supervisor's Office, Redding, California. The maps of the alternatives, included in a separate packet, graphically illustrate how the alternatives vary in spatial distribution of management emphasis across the Forests.

1. AIR QUALITY

Consequences Common to all Alternatives

In general, forest management activities consistently implemented with any of the alternatives would have very little, if any, measurable effects on air quality.

The dispersed nature of outdoor recreation use, even at highest total volumes, would yield low quantities of pollutants from such sources as campfires, motorboats, and driving for pleasure. The measurable air movement, which normally occurs in the mountainous settings of both Forests over 90 percent of the time, adequately disperses these pollutants.

Within the Class I, Yolla-Bolly-Middle Eel Wilderness significant air quality related values would be determined in cooperation with the Mendocino National Forest. These values would be monitored to assure prevention of significant deterioration as required by the Clean Air Act.

Activities such as timber harvest cleanup, woody lake debris cleanup, and wildlife habitat improvement could produce some air pollution (visibility impairment and particulate matter) for short periods of time. All alternatives emphasize utilization of woody debris over burning when feasible.

Where burning is required to meet management objectives, regulations require that the pollution itself be minimized by the methods used. In addition, burning should be carried on only when favorable meteorological conditions exist (e.g., wind, fuel moisture, temperature, inversion layers). These management activities would be timed and coordinated with other agencies to meet air quality standards. Wildfires, which could adversely affect air quality, would occur under all alternatives. The number of acres that would be burned annually from wildfire is estimated at 11,000 acres per year for all alternatives except Alternative CUR (15,000). Since wildfire is unplanned, it is exempted by the Clean Air Act from meeting air quality standards.

The number of fuels treatment acres is vastly reduced for all alternatives compared to the past 10 years. This reduction is due to biomass utilization, reduced timber harvest, and road building. The total acreage of fuel treatment for wildlife, timber, and fire management varies from approximately 5,880 acres per year in Alternative CBF to approximately 7,080 acres per year in Alternative CUR. While utilization of this material is being emphasized, a significant portion of the fuels reduction would still occur through prescribed burning. The alternatives with the highest number of acres being treated would have the highest prescribed burning programs. Although these acreages are significantly different, no degradation of air quality within the Class I area would occur because:

1. The Yolla Bolly-Middle Eel Wilderness is geographically located on the southernmost tip of the Trinity National Forest. Therefore, it is located away from areas of potential burning.

2. Burning prescriptions would be designed to avoid smoke intrusion into sensitive areas.

3. Burning would be coordinated with other agencies to achieve compliance with all applicable air quality standards.

4. Only short-term degradation would occur in the burn areas.

5. A no burn alternative would be selected if degradation was anticipated.

Consequences Specific to an Alternative

The following analysis makes a comparison of alternatives based upon: (1) the amount of fuels treated (acres); (2) the number of acres harvested; (3) the number of miles of road constructed; and (4) the number of recreation visitor days (RVDs) in the first decade.

Alternative PRF (Preferred Alternative)

When compared to Alternative CUR, this alternative would have 8 percent less fuel treatment acres, nearly the same number of predicted RVDs, 39 percent less acres harvested, and 4 percent less new road construction. Using probable annual pollutant generation from these sources, air quality related to activities on the Forests would improve when compared to Alternative CUR.

Alternative RPA (1990 RPA Program Emphasis)

This alternative would result in relatively no change in air pollutants from those occurring in Alternative CUR. Acres treated for fuels would decrease 7 percent, RVDs would increase 9 percent, road construction would remain the same, and acres of timber harvested would decrease by 8 percent when compared to Alternative CUR.

Alternative CUR (No Action/No Change)

Under this alternative it is estimated that fuels would be treated on a total of 7,080 acres annually. About 23 miles of new road construction would be added to the existing system each year, there would be 5,362,000 RVDs, and

a total of 9,662 acres of timber harvested annually. While this alternative has the greatest potential for creating air pollution, it would still be significantly less than that which occurred in the recent past.

Alternative CBF (Citizens for Better Forestry)

This alternative, when compared to Alternative CUR, would result in 17 percent less acres of burning for fuel treatment, about the same RVDs, 35 percent less new road construction, and 39 percent less timber harvest acres. It would, therefore, generate less air pollutants than Alternative CUR. This alternative would have the least impact on air quality.

2. BIOLOGICAL DIVERSITY

Consequences Common to all Alternatives

There are many factors that relate to the concept of ecological biodiversity. For purposes of this document, a basic assumption was applied. The most effective and efficient manner in which to maintain biological diversity and its associated attributes throughout forested and other vegetative landscapes is to allow for a diverse spectrum of ecosystems, their attributes, and associated species.

The diversity of terrestrial and aquatic species and/or their habitats is addressed in the wildlife and/or fisheries sections. Therefore, this section will deal primarily with the maintenance, enhancement, or change within the major vegetation types and/or their seral stages over time, and how they affect richness, evenness, and pattern (components of diversity).

In each alternative over 1,400,000 acres of vegetated lands would be allowed to "cycle naturally." This is defined as continuing through the processes of succession without major human-induced management. Natural processes would occur such as insects, disease, flood, fire, windthrow, etc. Some management such as fish/wildlife habitat improvement projects, would be allowed to occur. The potential estimated effects of "cycling naturally" for a 50 to 150 year period (very short ecological timeframe) would inciude but not be limited to:

--Loss of human-induced early seral stage areas;

--tending stands to move towards climax conditions (older seral stages);

--accumulation of dead standing/down materials;

--loss of existing human-induced fragmentation (clearcuts, roads);

--more homogeneous stands;

--reduction in total numbers of some plant/animal species (early seral stages) with increases in others (moderate to older stages);

--an increase in the area occupied by climax species;

--initial increase of shrub/hardwood species in some areas;

--reduction of shrub/hardwood species in closed canopy situations;

--occurrence of natural fire with some human-induced fire suppression; and

--reduction in active road systems.

The above types of affects would be beneficial for some species, detrimental for some, and neutral for others.

On the 500,000 acres subject to vegetative activities, the major effects on diversity components are related to timber and wildlife habitat management activities. Therefore, the following factors, which are common to all the alternatives analyzed in this Draft EIS, will be tracked.

1. Timber management activities, including silvicultural systems;

2. Natural and induced changes in seral stage composition on the Forests;

3. Interspersion or mosaic effects of suitable timber lands with lands that are unsuitable for timber; and

4. Management of chaparral.

Under all alternatives, treatment of chaparral (major vegetation type) would result in a variety of benefits and effects through: (1) conversion of existing chaparral to timber; (2) conversion of existing chaparral to a grass-rejuvenated brush mix; and (3) conversion of existing decadent brushfields to younger, more available stands of brush.

Conversion of chaparral to timber is not emphasized and would be done only where cost-effective and compatible with wildlife values. Most of the chaparral and brush is decadent and of limited value for grass and browse for livestock and deer and of no value for timber production. Any amount of treatment would help bring these lands under more productive management.

Some of the major effects of managing chaparral include:

1. Increased edge and diversity for wildlife (mosiac pattern);

2. Reduction of fuels to minimize fire hazards;

3. Increased short-term (less than 7 years) water yields;

4. Creation of younger, more vigorous chaparral fields on unsuitable timber lands;

5. Reestablishment of timber stands on suitable timber lands; and

6. Increased forage and browse for domestic livestock in some areas and wildlife utilization in other areas.

Richness

None of the alternatives would reduce the number of existing major vegetation types or species that exist on the Forests below the level of viability. On the 1,400,000 acres not being actively managed, components of richness such as snag densities, seral stages, hardwoods, riparian, etc., would cycle naturally.

On the 500,000 acres being actively managed, standards and guidelines for diversity components such as snag densities, seral stages, hardwoods, riparian, etc., would be required in each alternative. This would assure a certain level of diversity which, along with the lands not being actively managed, would maintain the viability of all existing non-threatened, endangered, and sensitive (TE&S) plant and animal species in all alternatives. Therefore, richness will not be discussed further in this section (refer also to the Wildlife section).

Evenness

Effects of Timber Management Activity. A major element of timber management activity is the rate at which timber stands are managed. One measure is the average age at which timber stands are harvested. This is often referred to as the rotation age.

Shorter rotations (average 110 years), as used in Prescription VIII (Timber Management), would convert some areas occupied by older seral stages to areas occupied by the early and mid-seral stages (seral stages 1, 2 and 3). Late seral stages (seral stage 4) would generally not be produced on the 500,000 acres unavailable for timber management under these shorter rotations. In the past, such treatments were applied primarily under a clearcut concept. Clearcutting would be reduced in Alternatives PRF, RPA, and CUR. Clearcutting would be eliminated in Alternative CBF. Many areas would be subject to leaving an average of 4-6 existing older green trees throughout the units (called green tree retention or GTR). This would provide a greater degree of vertical structural age class diversity and some retention of older over-mature trees. It should be noted, however, that the majority of existing older seral stages are placed in set-asides under all alternatives.

Longer rotations (average 120 years), as used in Prescriptions III (Roaded Recreation) and VI (Wildlife Habitat Management), would convert areas occupied by older seral stages to areas occupied by the early to mid-seral stages (seral stages 1, 2, and 3). A minimal amount of late seral stages (seral stage 4) would be produced on these lands. More retention of hardwoods and less intensive site prep vegetative management, resulting in more grass/forb areas, would occur here than under the shorter rotations. GTR would also be applied with clearcutting significantly reduced.

Long rotations (200+ years) would provide for more mid to late seral stage (seral stages 3 and 4) areas. Less early seral stages would occur than in intensive and modified management.

Seral stages 3a and 4a would not be produced under normal silvicultural treatments. However, the GTR treatment would allow for 3a and 4a stands. In addition, these seral stages would also be provided for on lands which are cycling naturally.

On lands where timber management would not normally occur and/or occurs at low levels, vegetative diversity would change primarily through natural succession. This would favor the late seral stages (seral stage 4) in some areas, especially those areas not subject to frequent fire events.

The amount of "unsuitable" timber land varies between alternatives. It includes wilderness, research natural areas, riparian corridors, wild and scenic rivers, National Recreation Areas, spotted owl habitat conservation and/or critical habitat areas, and inclusions of unsuitable lands inside large areas of suitable lands. These large blocks of land would allow for natural succession and diversity to occur.

Chaparral. There are some 180,000 acres of chaparral types on the Forests. These would tend to cycle naturally with the exception of a fairly low level of induced management primarily in the form of prescription fire.

Hardwoods. Mature hardwood trees within conifer stands, above the required basal area retention standard, could be removed and young hardwood habitats would not be allowed to reach maturity on lands subject to timber management activities.

Application of land allocation prescriptions and specific management standards to mitigate against the above losses, and the interspersion of undeveloped lands and inclusions of other habitat types, provides for dispersed mature hardwood habitats in all of the alternatives.

Hardwood types (stands of almost pure hardwoods) would not be managed intensively for timber production in any of the alternatives.

Natural and Induced Changes in Seral Stages. As previously described in Chapter II, one of the standards for diversity requires that a minimum of 5 percent of each of the Forests' major vegetation types be maintained in each identified seral stage for that type.

Refer to **Table IV-3** for a breakdown of seral stages by alternative. While maintaining diversity for each major type is important, about 96 percent (1,558,510 acres) of all major commercial timber vegetation types on the

Forests fall into mixed conifer (including red and white fir). Hardwoods and chaparral provide the next two major types with 190,000 acres and 180,000 acres, respectively. These would tend to cycle naturally over time. Therefore, the seral stage assessment would be made and tracked over time for the mixed conifer types only. All other major vegetation types would be evaluated and tracked on a project by project basis during planning and implementation.

Seral stage 3a would average 15 percent for all alternatives by the end of the 5th decade. Seral stage 4a would average 6-7 percent for all alternatives. All alternatives would be within 2 percent of each other for seral stages 3a and 4a over 5 decades. Seral stage 4a would also be enhanced by the application of GTR.

The amount of land in seral stage 1 averages 6-7 percent at the end of the 5th decade in all alternatives. Under all alternatives, seral stages 3b and 3c, combined, would average 29-30 percent by the end of the 5th decade. Seral stages 4b and 4c, combined, would average 15-16 percent by the end of the 5th decade.

Pattern

Effects of Interspersion of Suitable and Unsuitable Timber Lands. The Forests have identified two major classes of land: (1) lands suitable for timber production, on which timber vegetation manipulation would occur; and (2) lands unsuitable for timber production on which timber vegetation would not be actively managed. The amount of suitable timber land varies between alternatives (see **Table II-18**).

The proportion of unsuitable timber lands occurring as inclusions within moderately managed prescriptions (i.e., Prescriptions III [Roaded Recreation], VI [Wildlife Habitat Management] and VIII [Timber Management] ranges from 13 to 31 percent depending on the alternative. Thus, about one-fifth of the lands in these prescriptions would help provide an interspersed pattern of suitable and unsuitable lands. This mosaic would greatly reduce the possibility of large contiguous, homogeneous timber stands subject to intensive timber management and would help to provide movement corridors and islands of habitat within and between larger stands of vegetation.

Riparian areas occurring within Prescriptions III, VI, and VIII would also create mosaic patterns and provide movement corridors. In addition to the above, all alternatives have about 1,400,000 acres or 70 percent of the Forests' land base in a combination of Prescription V (Wilderness) or VII (Threatened, Endangered and Selected Sensitive Species). One other factor that would play a major role in the pattern of habitat (i.e., diversity) across the land base is the application of the 50-11-40 rule. That rule says that 50 percent of each one-quarter township must provide for timber stands (where possible to grow such stands) with an average of 11 inch diameter-at-breast height (dbh) and 40 percent crown closure.

Effects of Silvicultural Systems. The choice of silvicultural systems to best provide for habitat diversity depends on which wildlife species and assemblages are to be emphasized. Regardless of which treatment is used in a stand, some species and/or assemblages would benefit and others would not.

Overall, a mix of silvicultural systems in the Forests would probably best achieve habitat diversity objectives. See 'Effects of Timber Management Activity' earlier in this section for more discussion on silvicultural systems.

Table IV-3
Seral Stage Acres by Alternative*
(rounded to nearest thousand acres)

		Year 2040 (end of 5th Decade)			
		ALTERNATIVE			
Seral Stage	Current Situation (1989)	PRF	RPA	CUR	CBF
1	58,000	116,000	103,000	104,000	115,000
2	48,000	61,000	82,000	77,000	58,000
3a	311,000	242,000	244,000	236,000	242,000
3b & 3c	520,000	498,000	480,000	475,000	483,000
4a	148,000	105,000	101,000	111,000	105,000
4b & 4c	334,000	250,000	252,000	250,000	251,000
4c-older	211,000	368,000	358,000	364,000	370,000

* Total all major timber vegetation types combined.

Consequences Specific to an Alternative

Evenness

Seral stage analysis was assessed in two ways: (1) on a Forest-wide basis using the percentage of the amount of a given seral stage at a particular point in time as compared to the total Forests' vegetated land base; and (2) the percentage or amount of a given seral stage at a particular point in time as compared to the amount of the Forests in that seral stage in 1989.

Both of the above assessments indicate that the standard of having at least 5 percent in any given seral stage for all major vegetation types would be met in all alternatives at the end of the 50 years (year 2040). The only exception to this might be within the mixed conifer type for seral stage 2.

The Forest-wide assessment previously discussed indicates little difference between alternatives. The major difference is between the alternatives being considered in this Draft EIS as compared to Alternative CUR in the previous draft. The magnitude of reduced intensively managed timber lands is very significant. The following assessment of seral stage acres shows differences between the alternatives. (See **Table IV-3**).

All seral stage percentages vary little between alternatives through decade 5.

The quantity or amount of vegetated land that would occur under the various management intensities can be generally assessed by comparing the amount of acres of each prescription group by alternative (**Table II-14**). Alternative RPA has almost exactly the same percentage (26) of Prescription VIII (Timber Management) lands as does Alternative CUR. Alternatives PRF and CBF are similar with 8-10 percent less land base in Prescription IV (Roaded, High Density Recreation) and VIII than occur in RPA and CUR. Alternative CBF has almost twice as many acres in Prescription I (Unroaded Non-Motorized Recreation) as does Alternative PRF and at least 6 times as much as Alternatives RPA and CUR. All other land allocations are quite similar between alternatives with no more than an average variation of 5 percent.

Pattern

The greatest change in existing pattern of vegetative seral stages would occur on lands with a very high degree of habitat manipulation. Opportunity for greatest changes in existing pattern, especially in the seral stage 4 stands, would occur in Alternatives RPA and CUR which have 26 percent of the land base allocated to Prescription VIII, and 23 percent of the land base allocated to Prescriptions III and VI.

Under Alternative RPA, proposed chaparral management programs would vary from 5,000 to 10,000 acres treated per year. Under Alternative CBF 3,000 to 5,000 acres would be treated per year. Alternative CUR would involve 1,000 to 3,000 acres per year. Under Alternative PRF 3,000 to 5,000 acres would be treated in the 1st decade; this would increase to between 5,000 and 10,000 acres per year in decades 2 to 5. While the range being treated varies, the overall combined environmental consequences would not change significantly between alternatives due to the relatively low magnitude of the chaparral program in any alternative. Potential increased outputs of wildlife user days, deer population increases, etc., would also be relatively low and very localized. Net effect or benefit would be to help maintain existing levels of outputs.

All alternatives range from 22 - 26 percent of allocated lands being in Prescription III or VI combined which would be the next most intensive in terms of timber management. GTR would contribute to vertical seral stage diversity and to pattern as would application of the 50-11-40 concept.

The total amount of acres of 4c-older would increase from a starting point of 211,000 acres to over 350,000 acres for all alternatives by the end of the 5th decade. Alternative CBF would have the most with an estimated 370,000 acres.

3. BIOMASS

Consequences Common to all Alternatives

The issue related to biomass involves what wood material can be used for energy production while still meeting ecological needs, as well as what priorities would be followed in its allocation. The two main sources of biomass on the Forests are logging residue (slash from timber sales) and precommercial thinning residues.

Under all alternatives, the Forests' policy would be to ensure that enough firewood is available to meet the demand for personal use. In addition, sufficient biomass material must also be left on the ground to meet ecological needs for soils, plants, and animals. Therefore, the only material considered available for biomass utilization would be logging residue and thinning slash that is surplus to firewood and ecological site needs.

Overall, the availability of biomass material from logging residues is on the decline due to reductions in the timber land base. This is caused by setting aside suitable timber lands for the protection of other resource values, such as the spotted owl.

Consequences Specific to an Alternative

The supply of biomass is affected primarily by the level of timber harvest and by the amount of land from which it is obtained. Therefore, Alternatives RPA and CUR would result in the largest amounts of available biomass. Alternative CBF would provide the least opportunity for biomass utilization. **Table IV-4** shows the allowable sale quantity (ASQ) and the number of acres harvested each year in the first decade for each alternative.

The amount of precommercial thinning in the 1st decade would not vary significantly between alternatives. The amount of thinning would vary from a high of about 3,100 acres per year in Alternative CUR to a low of 2,500 acres per year in Alternative CBF.

Much of the biomass material currently generated is economically unavailable for collection. Increased value of residue as a source of energy could increase the amount that could be utilized. Improved biomass collection technology could also make unavailable material utilizable. Should biomass use increase in the future, alternatives with less potential available biomass may experience conflicts between the use of residues for power generation and personal use firewood.

Sawmill residue, which is currently a major source of energy fuel, is expected to continue to provide a larger source of biomass than in-forest logging residue. Again, alternatives with higher harvest levels (ASQ) would provide more potential mill wastes for energy production than alternatives with a low ASQ.

Table IV-4
Factors Which Affect the Amount of Material Available for Biomass

	ALTERNATIVE			
	PRF	RPA	CUR	CBF
Allowable Sale Quantity (ASQ) 1st Decade (MMBF*)	87.0	112.4	105.9	65.3
Annual Harvest Acres 1st Decade	5,900	8,890	9,660	5,880
Precommercial Thinning Acres 1st Decade	2,600	2,800	3,100	2,500

* MMBF = million board feet

4. BOTANY

Consequences Common to all Alternatives

All alternatives would provide for the protection of plants that are listed as sensitive by the Regional Forester. This is in accordance with Forest Service policy as set forth in Forest Service Manual 2670.

There are no Federally listed threatened or endangered plant species on the Shasta-Trinity National Forests. Trinity buckwheat (Eriogonum alpinum) is listed as threatened by the State of California.

All sensitive plant populations, currently known or identified in the future, would be placed in Prescription VII (Threatened, Endangered, and Selected Sensitive Species). All project proposals would be assessed for their potential impacts to known sensitive plant populations or suitable habitats.

Suitable habitat would be managed and monitored to increase or sustain viable populations of sensitive plant species throughout their recognized range.

Project proposals would be modified if loss of sensitive plants or habitat in the project area would lead to a decline in viability of the species on the Forest.

Consequences Specific to an Alternative

All alternatives protect existing populations of sensitive and endemic plants, but unoccupied suitable habitat is not conserved unless specified in a conservation strategy for the species. Therefore, this unoccupied habitat is vulnerable to impacts.

Sensitive plant populations are not static and may move into new habitat over time as the result of successional changes or other factors. Prevalent types of impacts that may cause loss or degradation of potential sensitive plant habitat include road building (and associated quarrying of road material), livestock grazing, off-highway vehicle use, fire suppression, and timber harvest.

It is difficult to predict the consequences of habitat loss and disturbance. Permanent loss or degradation of habitat can be assumed to have negative effects. Temporary surface disturbance of habitat may have negative, neutral, or even beneficial effects depending on the species.

In general, higher outputs for commodities such as timber (including road construction for access) and forage are correlated with greater losses of suitable habitat for sensitive plants. Alternatives RPA and CUR are, therefore, likely to have greater negative consequences for sensitive plant viability than Alternatives PRF and CBF. Because of large amounts of set-aside acreage in all alternatives, the chances of loss of suitable habitat are much less than that associated with past management.

The need to identify each sensitive plant's ecology and life requirements is addressed in the Standards and Guidelines section of Chapter 4 of the proposed Forest Plan.

5. CULTURAL RESOURCES

Consequences Common to all Alternatives

One of the issues identified during the early public involvement period concerned the disturbance or destruction of cultural resources that has occurred, or is thought to have occurred, as a result of Forest Service activities (**Public Issue #1**). In order to address this issue in a positive manner, as well as to respond to related management concerns, new direction has been developed in the proposed Forest Plan. This direction is embedded in all alternatives under Prescription XI (Cultural Resource Management), in the Forest standards and guidelines, and in the monitoring plan (contained in the proposed Forest Plan).

Prescription XI directs that highly significant cultural resources would be protected indefinitely from potentially damaging activities such as timber harvesting and road construction. The Forest standards and guidelines provide mechanisms to ensure that cultural resources potentially affected by land management activities would be identified and assessed as to their eligibility for the National Register of Historic Places. Eligible properties would be protected or adverse effects to them would be mitigated. Cultural resources not assigned to either Prescription XI or the standards and guidelines, would be managed according to the Archaeological Resources Protection Act of 1979 and Shasta-Trinity National Forests' Supplement #6 to Forest Service Manual 2361. The Forest standards and guidelines also ensure Native American access and use of sacred sites and provide for collection and/or use of traditional resources in all alternatives.

The monitoring plan in the proposed Forest Plan includes periodic inspection of activities to assess whether or not the above management direction is being met. This would be accomplished through an annual program which samples projects that included active protection of cultural resources. The intensity of sampling would be adjusted annually if the results of monitoring depart from established criteria.

The effects to cultural resources associated with Prescription XI would be the same for all alternatives, (i.e., all sites would be protected regardless of the alternative.) For the remainder of sites on the Forests, there would be instances where potential adverse effects would need to be mitigated. In all such cases, the required interagency consultations (i.e., (36 Code of Federal Regulations [CFR] 800) would be undertaken. The specific number of sites that might be affected is difficult to quantify precisely, since that number would result from a case-by-case analysis of costs (mitigation funds needed) and benefits (e.g., timber outputs gained).

It is unknown how the alternatives would contribute to or detract from the State Historic Plan. The existing State Plan does not specify any particular preservation targets for types of cultural resources, nor any goals for regions in California. However, the State Plan is being updated and revised. It is likely that many of the cultural resources associated with Prescription XI would contribute in some measure to the goals of the new State Plan.

The short-term versus long-term effects on cultural resources associated with Prescription XI would be the same. The short- and long-term effects to sites receiving other management direction (i.e., properties associated with Forest standards and guidelines and those sites not eligible for the National Register of Historic Places) would be more difficult to measure. Over the short-term (e.g., 10 years), the number of sites that would be lost (with or without mitigation) would be few in number. In the case of timber, the threat would occur for each site only once during the timber harvesting cycle.

Over the long-term, it is possible that some sites not associated with Prescription XI would be lost, particularly those located on suitable timber lands. Specific cultural resources are generally considered non-renewable. However, since less than one-fourth of the Forests has been intensively inventoried during the last 15 years, perhaps as many sites remain to be found as have already been located. The potential of losing sites, however, is greatly reduced from past levels due to the greatly reduced timber programs and the large amounts of set-aside acres in all alternatives.

Two important benefits relating to cultural resources can be associated, to varying degrees, with all alternatives: (1) the development of specific management direction that varies according to the value of a cultural resource should lead to more cost-effective management, as well as the preservation of highly significant sites; and (2) all alternatives continue resource management activities (particularly timber) that have, in the past, been indirectly responsible for most of the inventory, recording, and evaluation of cultural resources throughout the Forests. Regardless of the alternative selected, Forest personnel would continue to consult with other agencies such as the State Historic Preservation Office, the Keeper of the National Register of Historic Places, the Advisory Council on Historic Preservation, etc., as required by the National Historic Preservation Act, and other legislation.

The application of Forest Standards and Guidelines, as well as Prescription XI, would pose some constraints on the management of other resources. The constraints may be one of two kinds: a financial cost or a land use limitation. For example, construction of a road through an archaeological site, where it is infeasible to avoid the site, may require funds for mitigation. In the case of timber management, some areas might not be harvested because of the presence of significant cultural resources.

The specific constraints are developed when a project is actually designed.

Consequences Specific to an Alternative

As stated above, sites assigned to Prescription XI would be protected by all alternatives. The remaining sites (the majority) would be managed according to Forest standards and guidelines. In trying to estimate the effects of specific alternatives on cultural resources, it was concluded that using prescriptions with high to moderate ground disturbance, particularly activities associated with timber harvesting, would best approximate the risk to cultural resources. These include Prescriptions III (Roaded Recreation), IV (Roaded, High Density Recreation), VI (Wildlife Habitat Management), and VIII (Timber Management). It must be realized, however, that simply because cultural resources are located in areas assigned to these prescriptions it does not mean that the sites would be adversely affected.

During the last decade, the vast majority of cultural resources located in such areas (e.g., timber sales) have been protected. This pattern would not change markedly. Most site damage in the past has been inadvertent. New direction in the proposed Forest Plan should significantly eliminate such unintentional, adverse occurrences. Therefore, the following discussions are not intended to predict quantitatively any actual number of cultural resources to be disturbed, but rather, the potential of each alternative to cause effects that would need to be mitigated in some manner.

Alternative PRF (Preferred Alternative). Several measures were used to compare the alternatives. One involved summing all the acres assigned to the most land disturbing prescriptions for the four alternatives. This involved summing Prescriptions III (Roaded Recreation), IV (Roaded, High Density Recreation), VI (Wildlife Habitat Management), and VIII (Timber Management). Another measure was the number of suitable timber acres for each alternative, while another was the annual timber harvest for each alternative. Using these measures, Alternative PRF is estimated to have only a moderate potential to adversely affect cultural resources. Timber outputs, acres of suitable timber land, etc., are all relatively low.

Alternative RPA (1990 RPA Program Emphasis). This alternative is similar to Alternative CUR in its potential to affect cultural resources. Timber outputs, reforestation outputs, etc., are all fairly high. It ranks highest among all alternatives for its potential to affect cultural resources.

Alternative CUR (No Action/No Change). This alternative has the highest number of acres assigned to prescriptions involving ground disturbance. It is second to Alternative RPA in the number of suitable timber acres and proposed timber outputs (**Tables IV-11** and **IV-21**). Specific, potential risks to cultural resources include timber harvesting, reforestation, timber stand improvement, recreation, and road construction and reconstruction, etc.

Alternative CBF (Citizens for Better Forestry). This alternative has some of the lowest figures for timber and reforestation outputs, miles of road to be constructed and reconstructed, etc. Of all the alternatives, Alternative CBF would probably have the least potential to damage or adversely affect cultural resources.

6. FACILITIES

Transportation System

Consequences Common to all Alternatives

Little new arterial road construction would be anticipated under any of the alternatives considered but reconstruction is anticipated. The collector/local road system would be increased under all alternatives, but at a much slower rate than the past 10-15 years. In all cases the amount of new road construction would decrease significantly in the 3rd, 4th, and 5th decades.

In general, the number of miles of local roads needed for timber management purposes would vary directly with the level of timber harvesting proposed under a given alternative; therefore, the amount of land disturbed would increase accordingly as harvest levels increase. In all alternatives the amount of land disturbance from road building would be much less than the recent past due to the low level of timber harvest being proposed. As the amount of road and/or trail construction increases, the more likely a particular road/trail location would have to be modified to avoid cultural resources properties, sensitive plant sites, and threatened and endangered species habitats. This type of mitigation through avoidance would be present in any of the alternatives considered in this Draft EIS. Since this would be an impact resulting from the application of non-discretionary policies (i.e., mandatory legal requirements or minimum management requirements [MMRs]), they would be common to all alternatives. Consequently, there would be no significant differences between alternatives with respect to these non-discretionary features.

Consequences Specific to an Alternative

The principle indicator of both short and long-term environmental impacts caused by the transportation system would be watershed condition. Watershed condition is based on the cumulative watershed impact using equivalent roaded acres (ERA) below the threshold of concern (TOC). The ERA threshold calculation is an appropriate indicator of the number of acres that would be disturbed based on the miles of road built. See **Table IV-5** under the geology discussion in this chapter for the comparison.

With respect to road closures or obliterations, these directions are included under Forest standards and guidelines (e.g., 7e) and within each management prescription as defined by the associated standards and guidelines (refer to the proposed Forest Plan).

Some road improvements would be treated as necessary to preserve environmental conditions, improve safety conditions, and increase the structural strength for road maintenance and haul efficiency. This need would vary by alternative. The greater the number and diversity of public users, the greater the need for this type of improvement.

By the end of the fifth decade, the total miles of roads varies considerably between alternatives, with Alternative RPA having the most and Alternative CBF having the least. In all alternatives, about 85 percent of the road system would be complete by the year 2010.

The rate of road construction and the eventual road density would be greater in areas where timber is managed under uneven-aged selection systems.

From the standpoint of opportunities to develop a road system, Alternative CBF would constrain and/or prohibit road construction the most. Road construction would be least constrained under Alternatives RPA and CUR. Alternative PRF would constrain road development slightly more than Alternatives CUR and RPA. None of the alternatives materially affects the unroaded character of most of the California Wilderness Bill released acres (see Appendix C). This is because many of those acres are in Prescription VII (Threatened, Endangered, and Selected Sensitive Species.) Consequently, they are not available for timber harvesting and road construction.

Other Facilities

Consequences Common to all Alternatives

No major effects, changes, or differences between alternatives would be anticipated with respect to buildings and administrative facilities. Future changes, such as improved communication and transportation, may eliminate the need for some of the remote administration sites. There would be an on-going need to upgrade and replace some of these facilities.

7. FIRE AND FUELS

Introduction

Implementation of any alternative would influence the number of acres expected to be burned by wildfire and the acres that would receive fuel treatment. The environmental consequences from these events are common to all alternatives. The magnitude of the consequences depends on the event and is described for each alternative.

Consequences Common to all Alternatives

Wildfire. Under all alternatives, fire and aviation management direction would be to initiate a suppression response for control of all wildfires including private lands under direct Forest Service protection. Interagency fire cooperation would be emphasized under all alternatives. Suppression response within wildernesses may be changed from control to containment or confinement when specific Wilderness Area Management Plans are approved.

In past plans there was a large variation of acres allocated to timber harvest and associated fuels treatment and acres treated for natural fuels. In addition, there were different suppression efficiency levels applied to the alternatives. The suppression level is the most efficient level (MEL) as determined by the National Fire Management Analysis System (NFMA) in all alternatives except Alternative CUR. Alternative CUR is set at current levels which is 29 percent lower than MEL. This results in a large variation in predicted wildfire acres by alternative.

Due to the allocations to threatened and endangered habitat, which preclude timber harvest and fuel treatments for the predicted life of the Plan, and reduced harvest levels and harvest intensity on those acres available for timber harvest, it is predicted that the variation in wildfire acres would not be measurably different by alternative. Except for Alternative CUR, the only variation in the fire and fuels program predicted by alternative would be in the number of acres of fuels treatment for timber related and natural fuels. Although there would be differences they would not measurably affect the number of wildfire acres predicted. It is estimated that approximately 11,000 acres would be expected to burn by wildfire anually in all alternatives except CUR (15,000 acres).

In each alternative, the placement of fire lines and camps for the suppression of wildfires and the implementation of prescribed fires, could be affected by the presence of cultural properties, sensitive plant sites, threatened and endangered species habitats, and other features which must be protected under mandatory legal requirements. The effects of wildfire on individual resources would vary, with negative effects generally increasing as fire intensities increase. Regardless of intensities, wildfire could cause negative consequences to young plantations, water quality, air quality, and visual quality. Air quality would receive short-term degradation during burn-out. Visual and water quality would be temporarily degraded until restoration and recovery occur and the burned areas are revegetated.

Young plantations (less than 30 years old) could sustain very high, if not total, mortality when burned by wildfire. This is because the small, thin-barked trees are very vulnerable to heat when surrounding vegetation is burned. When management activities occur within established plantations, measures are taken to reduce fuel accumulations and thereby reduce flammability and fire intensities.

Positive consequences from low intensity wildfire include: (1) increased or rejuvenated wildlife habitat; (2) improved range land; (3) increased water yields; and (4) reduced potential for damaging wildfires. As fire intensity increases, effects on wildlife and grazing become less and less positive until negative consequences often occur at the very high intensity levels (Level 5 and Level 6).

Fuels Management. Prescribed fire is one of the most common methods of fuel treatments and it is expected to continue in the future. Utilization of wood fibre material (biomass) is becoming more common as a source of energy production. Utilization of biomass would not only assist in reduction of fuels after harvest activities but also after other management activities (i.e., stand tending). Utilization is the preferred fuel treatment method in all alternatives.

The environmental effects of prescribed fire are evaluated on a site-specific basis as burn plans and prescriptions are developed. Negative effects of prescribed fire are related to air quality, visual quality, water quality, and soil productivity. The overall effects of prescribed burning would depend on the amount of fuel treatment planned under each alternative. The acres of fuel treatment expected under each alternative are shown in the following section, Consequences Specific to An Alternative.

The environmental consequences resulting from prescribed fire differ between broadcast burning and the burning of piled material. The application of these techniques is determined by slope of the burn site. Slopes less than 40 percent can be piled for burning; slopes over 40 percent are broadcast burned.

Broadcast burning is limited to a much narrower time frame than pile burning because weather and fuel characteristics have less tolerance in the prescription. As a result, smoke is concentrated in a shorter period of time than it would be if piles were burned.

Pile burning permits more positive protection of sensitive soil productivity and water quality (because of the escape factor -- i.e., riparian management zones). Situations permitting piling also provide better economic circumstances for increased marketability of the residue (tractor ground). Burning prescriptions for piles occur over a much longer period of time than do prescriptions for broadcast burning. This permits positive compliance with air quality requirements.

The priority of natural fuel treatment would be: (1) public safety; (2) areas with significant capital investments (i.e., structures, plantations etc.); (3) high fire occurrence areas; and (4) for coordinated resource benefits.

Consequences Specific to An Alternative

Alternative PRF (Preferred Alternative). About 6,480 acres (2,080 acres of natural fuels and 4,400 acres of activity fuels) would be treated annually by utilization and/or prescribed fire during the 1st decade.

Alternative RPA (1990 RPA Program Emphasis). Natural and activity-created fuels would be treated by utilization and/or prescribed fire during the 1st decade at an estimated rate of about 6,580 acres annually (1,880 acres of natural fuels and 4,700 acres of activity fuels).

Alternative CUR (No Action/No Change). Natural and activity-created fuels would be treated by utilization and/or prescribed fire during the 1st decade at an estimated rate of about 7,080 acres annually (1,880 acres of natural fuels and 5,200 acres of activity fuels).

Alternative CBF (Citizens for Better Forestry). Natural and activity-created fuels would be treated by utilization and/or prescribed fire during the 1st decade at an estimated rate of about 5,880 acres annually (1,880 acres of natural fuels and 4,000 acres of activity fuels).

8. FISHERIES

Consequences Common to all Alternatives

Under all alternatives potential impacts to the fisheries resource, from sediment loading, would be greatly reduced. This is due to the reduction in timber harvest levels and road building and the large increase in set-aside lands. Risk of sediment loading on the 500,000 acres still subject to vegetative modification activities such as timber harvest, wildlife habitat improvement, and road construction would remain but would be mitigated by the riparian standards and guidelines being proposed in the Forest Plan.

Other associated risks to the fisheries resource include: (1) increased recreational sportfishing which could be detrimental to certain declining or sensitive fish stocks; (2) livestock use in riparian areas; and (3) fuel treatment which could cause riparian area and streamcourse damage. This risk is minimal, however, since broadcast burning is not allowed in riparian areas.

Potential impacts of resource management activities would be greater to streams than to lakes. Visual quality standards in the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) and in riparian areas near lakes and perennial streams would be managed to maintain their scenic values and near natural appearance. Timber management activities adjacent to ephemeral and intermittent streams have the potential to cause soil disturbances which may result in lowered water quality standards and increased sedimentation of downstream fish habitats. Forest-wide standards and guidelines, land allocation constraints, Best Management Practices (BMPs) and supplemental management area direction would be implemented to minimize impacts of program activities and ensure viable population levels of fisheries management indicators.

The original base year (Fiscal Year [FY]1982) of 363,000 pounds of commercial salmon being produced from National Forest lands has been added to by the increase in production from the Trinity River Hatchery. Hatchery production has increased salmon productivity on National Forest lands by an additional 328,000 pounds or a new total of 691,000 pounds. All alternatives reflect this new base equally. Hatchery production is projected to be maintained in a "steady-state" for the next 50 years and thereby continue to reseed the mainstem Trinity River.

The original base year (FY 1982) of 113,000 pounds of sport salmon being produced from National Forest lands has been added to by the increase in production from the Trinity River Hatchery. Hatchery production has increased salmon productivity on National Forest lands an additional 50,000 pounds or a new total of 163,000 pounds. All alternatives reflect this new base equally.

Until salmon habitat assessments are completed, the greatest emphasis on habitat improvement for anadromous fish would be placed on steelhead trout.

Once the prescribed structural goals are attained, new projects would be identified and implemented for the anadromous and inland fish habitat improvement programs. New project construction and maintenance would be implemented to replace and maintain lost and damaged structures.

The riparian standards and guidelines identify key watersheds as cornerstone to the viability of anadromous fish populations not only on the Shasta-Trinity, but also to the vital network of connected riverine ecosystems within the Klamath/Trinity River Basin. Key watersheds are areas that provide aquatic and riparian habitat essential to the maintenance, recovery, or enhancement of anadromous fish populations. Most importantly is that the potential affects upon aquatic ecosystems would receive first priority in the development and application of management alternatives.

The following key watersheds or key watershed areas have been proposed for the Shasta-Trinity National Forests:

1. Upper South Fork Trinity River
   [Hayfork Creek to Headwaters]
2. East Fork South Fork Trinity River
   [Mouth to Headwaters]
3. Lower Hayfork Creek
   [Mouth to 9-Mile Bridge]
4. Upper Trinity River
   [New River to North Fork Trinity]
   [Lewiston Weir to Lewiston Dam]
5. New River
   [Mouth to Virgin Creek]
6. Slide Creek
   [Mouth to Headwaters]
7. Virgin Creek
   [Mouth to Headwaters]
8. North Fork Trinity River
   [Mouth to Headwaters]
9. Canyon Creek
   [Mouth to Headwaters]

The interrelated riparian and aquatic habitats are limited ecosystems in the Forests. They yield, or have the potential to yield, high productivity levels of fish and wildlife. Anadromous and inland fish populations are dependent upon good water quality and quantity, instream and

bank (shoreline) habitat diversity, minimal sediment yield from surrounding watersheds, diverse aquatic and terrestrial food items, and a dynamic breeding population for their continued existence. Alteration or disturbance of their restricted habitat, depending on the extent, may lead to population declines. Several aspects of multiple-use management on National Forest lands may impair the capability of a watershed ecosystem or a riverine habitat to produce healthy fish stocks.

Recreation Management

California's recreation-oriented population will continue to increase and demand better or greater diversity in freshwater fishing opportunities over the next 50 years. Continued declines of salmon and steelhead populations and associated stream closures have reduced this diversity. The Shasta-Trinity's fisheries program is intended to improve recreational sportfishing opportunities above current levels. Three challenges arise: (1) historically used anadromous fish habitat is currently under-utilized as a result of reduced fish numbers; (2) the effects of six years of drought on anadromous and inland fish populations has not been assessed; and (3) the recovery of salmon and steelhead stocks must proceed with a scientifically sound ecological strategy plan. This plan must endorse the key aspects of protection and restoration. Maintenance and/or enhancement of wild fish stocks is essential.

Fishing demand at Shasta and Trinity Lakes, inland coldwater lakes (i.e. Iron Canyon, Lewiston, McCloud) and inland coldwater streams (i.e. Upper McCloud and Pit River) would increase at developed recreation facilities. High mountain lakes would receive an increase in dispersed angler pressure.

Fishing diversity would be enhanced on the Upper Sacramento River as the wild trout population rebounds from the disastrous chemical spill of July, 1991. Even as the Forest Service takes positive steps toward better watershed ecosystem and riverine habitat management, external influences or disturbances may negate the recovery of declining salmon and steelhead stocks. It is anticipated that winter-run steelhead population declines would rebound allowing for more angler fishing diversity within the Trinity River and select tributaries. Summer steelhead and spring-run chinook stocks would probably remain low, but they would improve as long-term recovery measures are implemented.

Finally, efforts to improve anadromous fish habitat, redband trout habitat, inland coldwater trout habitat in major perennials, and inland warmwater fish habitat would be increased. Natural recovery, coupled with habitat improvement efforts would result in: (1) achieving and maintaining healthy and robust fish populations and their habitats; (2) providing better fishing opportunities; and (3) increasing the diversity of fish species being sought by anglers. However, these efforts would probably fall short of meeting potential fishing demands on the Shasta-Trinity National Forests. The combination of past natural and human disturbances may be of such great magnitude that long-term recovery of potentially fishable stocks may be several decades away.

Roads and Facilities Management

One of the primary factors that has the potential to impact anadromous or inland fish streams is sediment loading. Salmon and steelhead declines are generally associated with agriculture, urbanization, damming, timber harvesting, and road building as well as commercial and recreational over harvest of stocks. Loss of highly productive watershed ecosystems and riverine habitat may be the single most consistent contributor to salmonid populations that are listed as "at risk of extinction". Road building is a major contributor of downstream sediment-loading. This results in riverine habitat damage on and off National Forest lands.

Protection would be increased in key watersheds to facilitate the recovery of anadromous fish. Further road obliteration and road closure opportunities, especially in the South Fork Trinity River basin, would be analyzed and implemented to prevent or reduce potential sediment loading to fish-bearing streams. New road construction would decrease significantly. Road reconstruction, which takes into consideration riparian and fish habitat needs, would remain fairly constant over the 50-year period. The number of miles of road maintenance would increase over the same time period.

The consequences of this action would be: (1) curtailing the loss of stream and river habitat complexity; and (2) establishing ecologically healthy watersheds throughout the Forests. These watersheds would be capable of sustaining diverse and abundant riparian habitats, assuring good water quality and quantity as well as the harmony associated with resilient and productive ecosystems.

Timber Management

The timber harvest program would have a reduced capability of impacting anadromous or inland coldwater fish streams when compared to potential harvest levels displayed 10 years ago. Most of the existing land base on the Forests has been allocated to Wilderness, National Wild and Scenic Rivers, northern spotted owl management, establishment of key watersheds, more comprehensive riparian standards and guidelines or other constraining designations. Anadromous and inland coldwater streams would benefit from the increased emphasis on riparian habitat protection as potential sediment producing projects are constructed or maintained outside riparian zones.

Under all alternatives, potential impacts to the fisheries resource, from sediment loading, would be greatly reduced. This is due to the reduction in timber harvest levels and associated road building and the significant increase in set-aside lands. Risk of sediment loading on the 500,000 acres still subject to vegetative modification activities such as timber harvest, wildlife habitat improvement and road construction would remain but would be mitigated by the riparian standards and guidelines being proposed in the Forest Plan.

Even with the decrease in timber harvesting, it is still necessary to prevent the impairment of a functional ecosystem by eliminating the introduction of undesirable sediments into streamcourses or negating irretrievable damage to riparian habitats. Prescription IX (Riparian Management) identifies nine specific riparian condition goals which prescribe maintenance or restoration conducive to the health and welfare of riparian ecosystems on the Forests. Functional standards and guidelines have been established for timber, roads and facilities, range, recreation, minerals, fire/fuels as well as for lands and hydropower developments and watershed and habitat restoration to ensure the integrity and protection of these riparian habitats.

There is a potential for more sediments to exist with an increase in the number of acres treated for timber harvest and related road construction. The application of Riparian Management Zones (RMZs) would help to buffer potential impacts to streams.

Livestock Management

Livestock can adversely affect riparian vegetation through trampling and grazing; they may also affect aquatic habitats or water quality. Management standards and guidelines, including mitigation measures, would be implemented as necessary to protect riparian habitats from existing and/or future adverse impacts.

Livestock use on existing National Forest allotments is expected to remain constant over a 50-year period. No new allotments would be added to the Forests' base. Impacts to riparian habitats are expected to be localized. Where conflicts occur, they can be resolved. Conflicts would occur more to inland coldwater streams than anadromous fish streams.

Implementation of better range improvement efforts such as water guzzlers, fencing, or rest rotations should be analyzed where livestock/riparian conflicts are identified.

Fire/Fuels Management

Prescribed fire for fuels management and habitat wildlife improvement have the potential to damage riparian areas and streamcourses if not properly controlled. This risk is minimal, however, since broadcast burning is not allowed in riparian areas.

Habitat Improvement

Through the application and management of key watersheds, Forest personnel would place an increased reliance on the natural long-term recovery of non-sensitive (fall-run chinook salmon and winter-run steelhead) and sensitive (spring-run chinook salmon and summer steelhead) anadromous fish habitat in the Trinity River basin. This is not intended to eliminate the fish habitat restoration or watershed rehabilitation program, but rather to compliment it. Increased protection, coupled with carefully selected restoration or rehabilitation projects along the ecosystem management pathway, would effect chances for a better long-term recovery.

Habitat improvement opportunities would be identified and implemented to the benefit of anadromous, inland coldwater, and inland warmwater fish populations. Implementation of the program varies according to emphasis and time frames. Outputs are displayed only to the program's prescribed goals, but they can be surpassed.

Successful accomplishment of the fish habitat improvement program, with its projected increases in fish production, is dependent upon: (1) ecosystem strategy planning; (2) capability of fish habitats to respond to applied treatments; (3) adequate fish numbers to seed improved habitats; and (4) success in the mitigation of potential impacts to streams, watersheds, and riparian areas from land use and development activities.

Consequences Specific to an Alternative

Alternative PRF (Preferred Alternative)

Habitat Improvement. This alternative would treat 1,500 acres for nonstructural habitat improvement and install 3,200 structures for anadromous fish over the 50-year period. For inland coldwater fish habitat (streams and lakes), 700 acres of nonstructural habitat improvement would be undertaken and 2,000 structures installed. Similarly, 1,000 acres of nonstructural habitat would be treated and 2,500 structures installed to benefit warmwater fish species.

Habitat improvement for non-sensitive anadromous fish species (fall-run chinook salmon and winter-run steelhead) would be increased on selected stream systems within the Trinity River Basin. Habitat improvement for sensitive anadromous fish species (spring-run chinook salmon and summer steelhead) would be evaluated and implemented on a limited basis. Low population numbers, coupled with under-utilization of stream habitats,

would determine the need, desirablity, and feasibility of a habitat improvement program for these sensitive fish species.

Habitat improvement for warmwater fish species would be increased at Shasta and Trinity Lakes. Fish habitat improvement would increase on major perennial inland fish streams. Surveys would be undertaken to analyze the need to implement habitat improvement on minor perennial inland fish streams.

Watershed rehabilitation projects would occur on strategic ephemeral and intermittent streams to protect and maintain rainbow trout and winter-run steelhead habitat in downstream perennial stream areas. Direct fish habitat improvements for rainbow trout and winter-run steelhead would occur in major and perhaps some minor perennial streams to accommodate a greater portion of major consumptive sportfishing.

Implementation of this alternative would result in the improvement of recreational sportfishing opportunities on the Forests above that of current levels.

Alternative RPA (1990 RPA Program Emphasis)

Habitat Improvement. This alternative would treat 1,500 acres for nonstructural habitat improvement and install 6,000 structures for anadromous fish over the 50-year period. For inland coldwater fish habitat (streams and lakes), 1,750 acres of nonstructural habitat improvement would be undertaken and 2,500 structures installed. Similarly, 2,250 acres of nonstructural habitat would be treated and 3,750 structures installed to benefit warmwater fish species.

Habitat improvement for non-sensitive anadromous fish species (fall-run chinook salmon and winter-run steelhead) would be increased on selected stream systems within the Trinity River basin and implemented for the first time in the Beegum Creek drainage. Habitat improvement for sensitive anadromous fish species (spring-run chinook salmon and summer steelhead) would be evaluated and implemented on a limited basis. Low population numbers, coupled with under-utilization of stream habitats, would determine the need, desirablity, and feasibility of a habitat improvement program for these sensitive fish species.

Habitat improvement for warmwater fish species would be significantly increased at Shasta and Trinity Lakes. Habitat improvement would be increased on minor and major perennial inland fish streams.

Watershed rehabilitation projects would be extended beyond strategic ephemeral and intermittent streams to significantly protect, maintain, and enhance rainbow trout and winter-run steelhead habitat in downstream perennial stream areas. Direct fish habitat improvements for rainbow trout and winter-run steelhead would occur in major and minor perennial streams to accommodate a significant portion of major consumptive sportfishing.

Implementation of this alternative would result in the significant improvement of recreational sportfishing opportunities on the Forests above that of current levels.

Alternative CUR (No Action/No Change)

Habitat Improvement. This alternative would treat 1,000 acres for nonstructural habitat improvement and install 3,520 structures for anadromous fish over the 50-year period. For inland coldwater fish habitat (streams and lakes), 200 acres of nonstructural habitat improvement would be undertaken and 1,000 structures installed. Similarly, 650 acres of nonstructural habitat would be treated and 1,600 structures installed to benefit warmwater fish species.

Habitat improvement for non-sensitive anadromous fish species (fall-run chinook salmon and winter-run steelhead) would continue at a low to moderate emphasis level within the Trinity River Basin predominantly within tributaries of the South Fork Trinity River. Habitat improvement for sensitive anadromous fish species (spring-run chinook salmon and summer steelhead) would be evaluated and implemented on a limited basis. Low population numbers, coupled with under-utilization of stream habitats, would determine the need, desirablity, and feasibility of a habitat improvement program for these sensitive fish species.

Habitat improvement for warmwater fish species would continue at a low to a moderate emphasis level at Shasta and Trinity Lakes. Treatment of reservoir habitats would depend heavily on establishing working partnerships with local and regional groups. Partners would contribute 80 percent or more of the improvement costs. Very limited fish habitat improvement would occur on a few major perennial inland fish streams. No fish habitat improvement would occur on minor perennial inland fish streams.

Watershed rehabilitation projects would occur on strategic ephemeral and intermittent streams to protect and maintain rainbow trout and winter-run steelhead habitat in downstream perennial stream areas. Direct fish habitat improvements would occur first for steelhead trout, second for largemouth bass, third for redband trout, and finally, for rainbow trout in a few major perennial streams to accommodate consumptive sportfishing.

Implementation of this alternative would result in the improvement of recreational sportfishing opportunities predominantly for anadromous fish. It would also reflect an increasing management desire to emphasize

warmwater fisheries at Shasta and Trinity lakes and redband trout management at Trout Creek.

Alternative CBF (Citizens for Better Forestry)

Habitat Improvement. This alternative would treat 1,500 acres for nonstructural habitat improvement and install 3,200 structures for anadromous fish over the 50-year period. For inland coldwater fish habitat (streams and lakes), 700 acres of nonstructural habitat improvement would be undertaken and 2,000 structures installed. Similarly, 1,250 acres of nonstructural habitat would be treated and 2,100 structures installed to benefit warmwater fish species.

Habitat improvement for non-sensitive anadromous fish species (fall-run chinook salmon and winter-run steelhead) would be increased on selected stream systems within the Trinity River Basin. Habitat improvement for sensitive anadromous fish species (spring-run chinook salmon and summer steelhead) would be evaluated and implemented on a limited basis. Low population numbers, coupled with under-utilization of stream habitats, would determine the need, desirablity, and feasibility of a habitat improvement program for these sensitive fish species.

Habitat improvement for warmwater fish species would be increased at Shasta and Trinity Lakes. Fish habitat improvement would increase on major perennial inland fish streams. Surveys would be undertaken to analyze the need to implement habitat improvement on minor perennial inland fish streams.

Watershed rehabilitation projects would occur on strategic ephemeral and intermittent streams to protect and maintain rainbow trout and winter-run steelhead habitat in downstream perennial stream areas. Direct fish habitat improvements for rainbow trout and winter-run steelhead would occur in major and perhaps some minor perennial streams to accommodate a greater portion of major consumptive sportfishing.

Implementation of this alternative would result in the improvement of recreational sportfishing opportunities on the Forests above those of current levels.

Threatened, Endangered, and Sensitive Species

Consequences Common to all Alternatives

All future sites of Federally-listed threatened or endangered (T&E) species would be fully protected and managed according to Prescription VII (Threatened, Endangered, and Selected Sensitive Species). All alternatives would meet the intent of the respective recovery plan for each designated species.

Threatened. At present, there are no known Federally-listed threatened fish species on the Forests.

Endangered. At present, there are no known Federally-listed endangered fish species on the Forests.

Sensitive. All known or future sites necessary to provide for viable populations of sensitive fish species would be fully managed and/or protected as necessary. Overall, the amount of Prescription VII habitat would fluctuate by no more than five percent among each of the four alternatives.

Forest-wide and management prescription standards and guidelines, Best Management Practices (BMPs), riparian management zones (RMZs), and supplemental management area direction would be implemented to protect and maintain T&E and sensitive fish habitat to ensure the viability of fish stocks among all alternatives.

The spring-run (summer) steelhead is the only fish species listed as sensitive by the Shasta-Trinity National Forests. The spring-run chinook is recognized as a sensitive fish species in the Klamath River system but not within the Trinity River Basin. Summer steelhead habitat would be managed initially for species preservation, especially in the South Fork Trinity River. Key tributaries containing summer steelhead populations would remain closed to fishing until the California Department of Fish and Game (DFG) determines the closure's efficacy. Summer steelhead would not be managed for major consumptive sportfishing unless an increase in population numbers can be projected by DFG to sustain such a fishery. This would result in a loss of fishing diversity on the Forests for the immediate future.

Salmon, steelhead, and trout populations would benefit from reduced management activities, such as timber harvest, road building, and prescribed burning in riparian areas. The increased emphasis on key watersheds, more restrictive riparian management standards and guidelines, the establishment of northern spotted owl HCAs, and the development of Wild and Scenic River Management Plans would also benefit these fish species. These actions would result not only in the maintenance and protection of known summer steelhead habitat, but also in the strengthening and diversifying of populations over time.

9. FOREST PESTS

Consequences Common to all Alternatives

All alternatives would continue to follow an integrated pest management (IPM) approach. This would allow use of strategies most appropriate to the situation and the theme of the alternative. Because Alternative CBF prohibits the use of pesticides there would be limits in controlling some pests. Not all insect, disease, and animal injury is undesirable in the forest ecosystem, but for the purpose of this section damage will refer to that which adversely affects management goals and objectives.

Maintaining and improving forest health is a goal which may be defined differently for each alternative. The health of a forest is partly defined by the human desires associated with each area. If adverse impacts of pests on a resource increases or threatens to increase to a level that interferes with management objectives, the options available to control this damage would be evaluated and the selected option would be integrated into project activities. Biological effectiveness, environmental safety, and compatibility with other resources and concerns would be considered when selecting a pest management option.

Implementation of any of the alternatives would involve different levels of pest management opportunities and would likely result in varying severities of pest-related injury on the Forests. Indicators of pest-related injury include tree mortality, reduced growth, top-killing, and reduced quantity and quality of seed production. Damage can result in sawtimber defect, understocking, failure and delay of regeneration, reduced site productivity, degradation or closure of recreation sites, increased incidences of hazardous trees, and undesirable vegetation changes. The latter changes can affect numerous resources, including visual quality, wildlife and fisheries habitat, and wilderness quality.

Vegetation management provides the best opportunities to prevent or reduce the amount and impact of pest-related damage, although direct actions against pests may be necessary in specific situations. In order to compare the consequences of each alternative on forest pests, the intensity of vegetation management is used as a proxy to indicate the opportunity to prevent and reduce damage. With greater opportunity to manage vegetation, less damage would be anticipated.

Areas where the vegetation is managed intensively would present the greatest opportunity to reduce or prevent pest losses. Other areas where condition of the vegetation is important, such as developed recreation sites, would also present significant pest management opportunities. Areas such as wilderness and semi-primitive recreation, on the other hand, would present minimal opportunities to control pests. Areas managed non-intensively would have moderate pest management opportunities.

The differences between alternatives in forest pest activity would be a result of the management objectives and prescriptions implemented in each alternative. The percent of the total Forests' land base, categorized as having "maximum", "moderate", "limited", or "minimal" opportunity to prevent or reduce pest-related damage by vegetation management, is displayed by alternative in **Figure IV-1.**

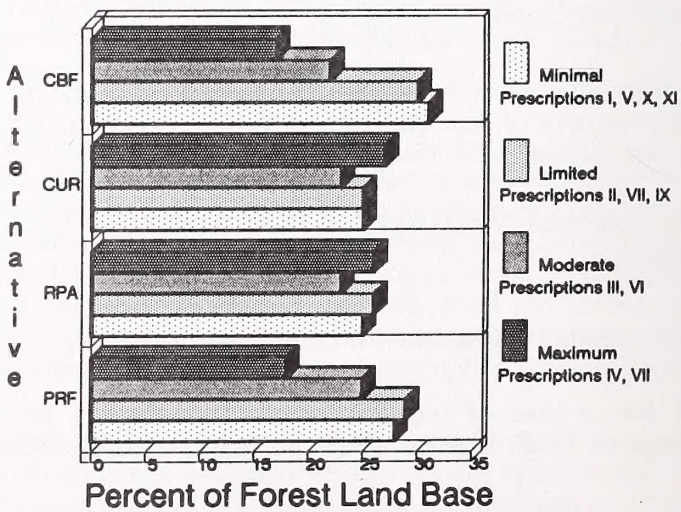
A discussion of silvicultural systems and their relationship to forest pest activity and control is found in Appendix J.

Consequences Specific to an Alternative

Alternative PRF (Preferred Alternative). This alternative would have an intermediate level of opportunity for minimizing pest activity. The lower acreage of intensively managed lands compared to Alternatives RPA and CUR would reduce the intensity of stand management activities and increase damage from forest pests. Areas where vegetation is managed intensively should have low levels of pest activity.

Alternatives RPA (1990 RPA Program Emphasis) and CUR (No Action/No Change). These two alternatives would have the greatest opportunities for minimizing pest activity. They would also have the greatest need if timber outputs are to be attained. Pests of mature forests,

Figure IV-1
Opportunities for Minimizing Forest Pest Activity



e.g., decays and wood borers, would become less important, while pests of younger trees, especially in plantations, would become more significant. Pest damage should be the lowest of all alternatives.

Alternative CBF (Citizens for Better Forestry). Pest management opportunities would be the least of all alternatives. Because herbicides would not be used and there would be restrictions on the use of pesticides, including biologicals, opportunities for IPM would be limited. This is especially true of defoliators in some areas; this may affect visual quality. Plague occurrences may increase in developed recreation areas because of the lack of pesticide use. This may conflict with existing agreements with other public agencies, such as county health departments and the Animal and Plant Health Inspection Service (APHIS). No pest suppression in wildernesses may result in increased damage and increased costs of suppression to surrounding areas outside of wilderness. This may also conflict with other agencies' responsibilities, specifically the eradication of exotic organisms. The emphasis on lower intensity timber management would increase the level of pest activity and injury.

10. GEOLOGY

Consequences Common to all Alternatives

No alternative would affect the physical presence of minerals. Therefore, geology, as it relates to mineral deposits, is common to all alternatives.

Volcanic and seismic hazards would be constant and unchanged for all alternatives. However, the hazard of initiating slope instability and resulting impacts to water quality would differ by alternative. Although slope stability investigations are performed for nearly every land disturbing project, slope failures can occur as a result of unforeseen circumstances or a function of an intensive storm event which exceeds design standards. To minimize slope failures, highly unstable areas have been identified and a Forest standard and guideline has been developed that prohibits management activities on these lands.

Compared to a decade ago, vegetation treatments are occurring on fewer acres. Clearcutting has been significantly reduced. Road construction has also been reduced. These factors contribute to less potential impacts to landsliding. Standards and guidelines offer resource protection for soil quality, including compaction, erosion and productivity, and for riparian areas. Therefore, the risk of water quality degradation through management related mass wasting is not significant.

Consequences Specific to an Alternative

Each alternative would have a different risk of initiating slope instability due to the amount of road construction, number of stream crossings, and intensity of timber harvesting.

As the level of roading and harvesting increases, the risk of initiating slope failures would likely increase. Therefore, in this analysis, acres of timber harvest and acres of new road construction would be used as indicators of the relative risk of initiating slope instability for each of the alternatives. **Table IV-5** lists these acres.

The alternatives were ranked in terms of relative risk, which was based on the number of acres of timber harvested. New road construction is limited for all alternatives. (See **Table IV-5**). Therefore, new road construction would not be included in this evaluation. The ranking of alternatives, which resulted from the application of these criteria, (from the least to the greatest risk) was as follows: PRF, CBF, RPA, and CUR. The following discussion expands on the reasons for this relative ranking. All alternatives are compared to current direction, Alternative CUR.

Alternative PRF (Preferred Alternative). This alternative would have about 39 percent fewer acres of timber harvest than Alternative CUR. Therefore, this alternative has the second lowest potential for slope instability.

Alternative RPA (1990 RPA Program Emphasis). Compared to Alternative CUR the implementation of this alternative would have a slightly lower potential for initiating slope instability. There would be an 8 percent decrease in timber harvested acres compared to Alternative CUR.

Alternative CUR (No Action/No Change). Implementation of this alternative would result in harvesting timber on an average of 9,660 acres. This is the greatest of all the alternatives. Slope failures related to management activities have been observed during extreme storm events. However, these landslides occurred on only a small portion of the managed land base, and at the same time that landslides occurred on unmanaged lands. This trend would likely continue if this alternative is implemented.

Alternative CBF (Citizens for Better Forestry). Implementation of this alternative would result in a 39 percent decrease in timber harvested acres. This alternative has about the same risk as Alternative PRF but less than all the other alternatives considered.

Table IV-5
Timber Harvest Acres and Road Construction by Alternative
(Average Annual Acres for the First Decade

Alternative		Timber Harvest (acres)	Road Construction (acres)
PRF	(Preferred Alternative)	5,900	39
RPA	(1990 RPA Program Emphasis)	8,890	40
CUR	(No Action/No Change)	9,660	40
CBF	(Citizens for Better Forestry)	7,452	28

11. LANDS

Consequences Common to all Alternatives

Included under this subject heading are discussions of the environmental consequences common to all alternatives on: (1) landownership adjustments, including land purchase programs, (2) interagency exchange, (3) non-recreational special-use management, (4) land withdrawals, and (5) property line-related encroachment.

Landownership Adjustment. The ownership pattern within the Shasta-Trinity National Forests provides considerable opportunities for landownership adjustments through land exchanges, donations, and purchases. Adjustments would provide consolidated ownership patterns in areas of intermingled landholdings so that lands can be managed more effectively. The resulting compact ownerships make possible lower maintenance, supervision, and improvement costs. Examples of land exchange benefits (consequences) are:

1. Shorter boundary lines, easier to mark and maintain;
2. Fewer trespass problems, claims, and lawsuits;
3. Lower costs for road construction and maintenance due to more compact ownership;
4. Increased flexibility to develop lands in ways not otherwise possible or practicable; and
5. Reduced need for rights-of-way over private land.

Also, exchange or purchase often makes valuable lands available for public use. Additional examples of public benefits that could result from proper acquisitions are:

1. Better control of erosion in mountain watersheds which supply water to downstream users or communities;
2. Acquisition of important recreation lands, or other lands such as critical wildlife habitat;
3. Protection of the wilderness environment; and
4. Isolated timber lands can be made economically accessible for easier forest management.

The intent, regardless of alternative, would be to continue favorable land exchanges with private landowners, such as Sierra Pacific Industries, John Hancock Insurance Company (successor to Champion International Corporation), and Roseburg Lumber Co. Forest personnel are evaluating opportunities for additional exchanges with these companies.

Some of the private lands to be acquired under future exchanges are located within existing Wildernesses. Exchanges involving these lands will continue until the goal of acquiring high priority classified lands and adding them to the National Forest system is achieved. The trade-off, therefore, would be between the amenity values on the offered private lands versus the timber volumes being foregone to private ownership from the selected National Forest lands.

Land purchase programs are financed principally through Land and Water Conservation Fund money authorized by Congress. However, partnerships with Trust for Public Land and the Nature Conservancy, as well as the endowment funds, are an asset to acquiring lands. High priorities for funding are for acquisition of private lands within existing or proposed Wildernesses, National Recreation Areas (NRAs), and/or approved recreation composites. The purchase program is based on a willing seller/willing buyer arrangement.

Regardless of the alternative, the presence of cultural properties, sensitive plant sites, threatened and endangered species habitats, and other resources, which must be protected under statutes, could cause modifications in landownership adjustment activities. For example, National Forest lands with these features identified for disposal under a land exchange could be deleted from a proposed transaction. Conversely, non-National Forest lands with these unique features could be identified for addition to the National Forest system in order to meet the objectives of the legislation.

The impact of these features on the Shasta-Trinity's land exchange program would not vary between alternatives because the ultimate goals and objectives for landownership adjustment through exchange would be common to all alternatives. With respect to land purchase, the larger the acquisition program the more likely the above considerations would have to be taken into account.

Non-Recreational Special Uses. The Forests' ownership pattern necessitates that some occupancy and use of National Forest land be permitted so private or other public lands can be appropriately used. None of the alternatives considered are expected to impact this program. Special-use permits are issued, when proper, upon compliance with reasonable conditions for the protection and administration of the National Forests.

Land use activities are generated from sources outside the Forest Service. Demands for special-use permits are expected to be the same for all alternatives with similar impacts on the Forests' resources. Some anticipated

resource consequences are the loss of land for other Forest uses, erosion or other resource damage from inadequate maintenance of private roads, and restrictions on some forest management activities in the vicinity of private uses.

Withdrawals. Lands may be withdrawn from mineral entry, at an agency level, for roadside zones, administrative, recreation, and power sites. To protect the integrity of some campgrounds, Section 507 of the Federal Land Policy Management Act of October 21, 1976, "Right-of-Way Reservation", may be requested. Some lands are also withdrawn by Congress for Wilderness and Wild and Scenic Rivers, and at the Department level for Research Natural Areas.

In compliance with Public Law 94-579 (Section 204), each agency level withdrawal would be reviewed in conjunction with the Secretary of the Interior to determine whether it should continue and for how long. This review has been completed.

Land Surveys and Occupancy Encroachment. The Forests' landline location program has increased significantly during the past five years. Consequently, the discovery of occupancy encroachment has also increased. These encroachments, if applicable, can be handled by the Small Tracts Act.

Landline location needs would not vary substantially by alternative. Therefore, there would be little or no difference in relative impacts of the described alternatives on encroachment cases related to property lines.

The consequences of not surveying landlines can be simply explained by the fact that landowners or land managers, either private or Federal, cannot manage land if they do not know where it is. It is important to have the precise landlines when the land values are higher, and when the land is more intensely managed.

Transportation and Utility Corridors. Corridors have not been designated in any alternative because there is inadequate information to prejudge the future needs for rights-of-way access across the National Forests. Forest-wide directions provide for establishment of future corridors, if needed. Therefore, there would be little or no difference in relative impacts of the described alternatives. Proliferation of rights-of-way outside existing corridors would be minimized.

Rights-of-Way for the Forests' Transportation System. Rights-of-way over about 100 miles of roads and 45 miles of trails are still needed. These roads and trails are part of the Forests' transportation system. The consequences of not acquiring these rights-of-way are:

1. Road or trail segments could be closed by the landowners (either general or selective closures);

2. Some projects, such as timber sales, would be deferred; and

3. Additional costs would be incurred to reroute those private road segments where it is physically and economically feasible.

Hydroelectric Power. Existing hydroelectric power facilities would be allowed to continue under all alternatives. New hydroelectric projects would also be allowed, subject to environmental analysis and impact mitigation requirements on an individual project basis. These projects would be subject to prohibitions or restrictions imposed by designation of areas (Wild and Scenic Rivers and Wildernesses) and/or the application of management prescriptions. The Wilderness Act prohibits development of hydroelectric facilities in existing wildernesses (except in rare cases). The Wild and Scenic Rivers Act precludes hydroelectric development in designated or proposed Wild and Scenic Rivers. A rare exception, however, is a project in a "recreational" designated segment that does not affect the river values. There are 498,776 acres designated as Wilderness and 33,728 acres in Wild and Scenic Rivers, for a total of 532,504 acres, on which hydroelectric development would be prohibited.

The development of hydroelectric power is a process that is initiated by agencies, companies or individuals outside the Forest Service. The Federal Energy Regulatory Commission (FERC), upon consultation with the Forest Service, is responsible for determining whether proposals for hydroelectric development are: (1) compatible with purposes for which the National Forests were created, and (2) consistent with the Nation's need for energy in light of the other public needs for the land proposed for development. The Forest Service is responsible for determining what conditions are necessary to protect National Forest resources in a license for a hydroelectric project. Should a project be exempted from licensing by FERC, the Forest Service is responsible for permitting and determining the terms and conditions of any such permit. Exempted projects are subject to requirements by local agencies such as the California Department of Fish and Game (DFG).

Hydroelectric development would be controlled and impacts mitigated by the development of site specific environmental analysis and documentation of effects for each proposal before a decision is made to permit the project.

Consequences Specific to an Alternative

Approximately 320 acres of land would be purchased per year under Alternatives PRF, CUR, and RPA.

Approximately 480 acres would be acquired by purchase under Alternative CBF.

There would be no specific consequences resulting from implementation of any of the alternatives on non-recreational special uses, withdrawals, interagency exchange, land surveys and occupancy encroachment, transportation and utility corridors, and rights-of-way for the Forests' transportation system.

The alternatives considered in the proposed Forest Plan would affect the development of hydroelectric power because of the number of acres allocated to Wilderness, Wild and Scenic Rivers, and Prescription I (Unroaded Non-Motorized Recreation). Prescription I would severely restrict access and the ability to economically transmit power. The Wild portion of Wild and Scenic Rivers would be managed under Prescription I. Designation as Wilderness or Wild and Scenic Rivers would be prohibitive to development and allocation to Prescription I severely restrictive. The restrictions placed on hydroelectric development by alternative are shown in **Table IV-6.**

Alternative CBF most severely restricts hydroelectric development. Alternative CUR is least severely restrictive with Alternatives RPA and PRF in the middleground. These alternatives would be most applicable to small-scale development. Overall, Alternative CBF has the greatest impact on hydroelectric development; Alternative CUR has the least.

Table IV-6
Acres by Alternative Affecting Hydroelectric Development

	PRF	RPA	CUR	CBF
Prohibitive				
(1) Wilderness	--	--	--	7,720
(2) Wild and Scenic				
(a)Wild	13,440	--	--	18,176
(b)Scenic	5,336	--	--	8,032
(c)Recreation	928	--	--	11,104
Total	**19,704**	--	--	**45,032**
Severely Restrictive				
Prescription I (net)	65,048	22,092	5,027	120,630
Total	**65,048**	22,092	5,027	120,630
GRAND TOTAL	**84,752**	22,092	5,027	165,662

* Wild portions of Wild and Scenic Rivers have been subtracted to avoid duplication.

12. LAW ENFORCEMENT

Consequence Common to all Alternatives

In comparing the existing law enforcement problems associated with any of the alternatives, the consequences would be similar. The law enforcement problems would be more a function of social morality and economics, rather than a given alternative intent or emphasis.

The cannabis issue is probably the most visible law enforcement situation. However, in recent years substantial progress has been made in reducing violations. A dramatic increase in the problem could be expected should there be a significant reduction in areas available for timber harvest. A reduced timber harvest holds the potential for a two-fold impact. The economic incentive to produce marijuana, as an alternative income, would occur simultaneously with a reduced deterrence created by the reduction of management activity and legitimate presence in large tracts of land suitable for cannabis cultivation. Another potential consequence of significantly reduced timber harvest, in addition to outright theft of timber, is wildland arson. An alternative source of income for idle timber harvest equipment is rental to the agency responsible for fire suppression activities. A second financial incentive for arson is the perception that burned timberland would potentially be offered for salvage logging operations.

Additionally, to the extent that land use allocations or resource management activities differ from established public use patterns or expectations, conflicts can be expected to occur. Road closures for resource protection purposes, campground closures due to budget reductions, and restrictions on traditional use for the protection of endangered species are expected to result in increased trespass and vandalisim.

13. MINERALS

Consequences Common to all Alternatives

Most environmental consequences resulting from mineral activities are similar in all alternatives. For example, the protection of cultural resources may require the incorporation of special stipulations in plans of operation and mineral leases in order to mitigate adverse impacts. Also, this may be true for other features or resources for which protection is required by statute, such as threatened and endangered species habitat and sensitive plants. Such measures may be used under any alternative. Since the protection of some resources is dictated by laws and regulations, the impacts on the management of the mineral resources are similiar in all alternatives. When any mineral resource is utilized, its depletion as a natural resource is irreversible, but the commodity has entered the market.

Locatable Minerals. Any person proposing to conduct mineral operations, such as prospecting, exploration, development, extraction, or reclamation, which might cause surface disturbance must submit a Notice of Intention to Operate with the local District Ranger. If the District Ranger determines that the operations would likely cause significant disturbance of surface resources, the operator must submit a Plan of Operations as directed in 36 CFR 228. Through approval of mutually acceptable plans of operation, operations are conducted so as to minimize adverse environmental impacts.

Mining activities may vary from simple projects involving little surface disturbance to complex, high-density programs that disturb all of the surface land area. These complex programs may involve detailed rehabilitation planning. Depending on the size of operation, short-term effects may have considerable impact on surface resources while the long-term effects may be moderated through reclamation. In a large-scale operation, reclamation planning takes into account the reality of the situation. It takes into account the benefits derived from a surface configuration much differently than prior to the mining operation.

Leasable Minerals. A number of geothermal and oil and gas lease applications covering the Shasta-Trinity National Forests has been received by the Bureau of Land Management. Leases are issued only after the Forest Service submits recommendations regarding each application. The recommendations are based on an environmental analysis and the consequences resulting from the foreseeable development of the resource. The leases contain standard stipulations/conditions which protect the environment. Additional stipulations/conditions are added to place emphasis on site-specific needs. The stipulations/conditions are structured so that they can be applied on a site specific basis which will protect the environmental attributes of the area. Further restrictions can be used to mitigate surface disturbance of special resources such as cultural resource sites. Adverse environmental effects would be mitigated by the application of standard and site specific lease stipulations.

Discovery during exploration may lead to long term development. In this event appropriate environmental analysis would take place prior to developing the resource. The development would provide road access to other forest resources and disperse land uses. Long-term development would eventually result in the depletion of the resource. At the same time, the mineral commodity would be entered into the market place for consumption.

Mineral Materials. These materals include common varieties of sand, gravel, rock, cinders, etc. They are quarried or excavated under authority of a mineral materials permit. The permit contains standard terms and conditions which are adequate to protect the environment. A reclamation plan is required for operations with significant ground disturbance. Long-term adverse effects on surface resources are appropriately mitigated.

Consequences Specific to an Alternative

Assuming that an environmentally suitable plan of operations is developed, adverse impacts from mineral development are expected to be minimized under all alternatives. Outputs are directly related to the amount of land open to mineral entry.

Some areas are withdrawn from location under the General Mining Laws in order to restrict activities. A withdrawal maintains other public values in the area or reserves the area for a particular public purpose or program. Withdrawals are made, where needed, to reserve areas such as Research Natural Areas (RNAs), Wildernesses, wild rivers, selected administrative sites, etc.

The baseline withdrawal acreage as of 1984 is 927,000 acres. The potential for additional withdrawals varies by alternative. Withdrawals would be a direct function of the number of acres commited to RNAs, Wilderness or wild portions of Wild and Scenic Rivers. Acres displayed for RNAs are those outside existing withdrawn areas such as wilderness, or areas to be withdrawn by wilderness in the displayed alternative.

Alternative PRF (Preferred Alternative). This alternative allocates 24,760 acres for RNAs, none for Wilderness, and 6,432 for wild rivers, for a total of 31,192 acres.

Alternative RPA (1990 RPA Program Emphasis). This alternative has the least number of acres allocated;

13,400 for RNAs, none for Wilderness, and none for wild rivers. This alternative has the least potential for withdrawals.

Alternative CUR (No Action/No Change). This alternative allocates 21,470 acres for RNAs, none for wilderness, and none for wild rivers.

Alternative CBF (Citizens for Better Forestry). This alternative allocates 26,970 acres for RNAs, 7,720 for Wilderness, and 7,808 for wild rivers for a total of 42,498 acres. This alternative has the greatest potential for withdrawal acres.

14. RANGE

Consequences Common to all Alternatives

The necessity to protect and/or mitigate the effects of grazing upon unique resource attributes would not vary between alternatives. These resource attributes are cultural properties and threatened and endangered species habitats which are protected under statute. For example, under any of the alternatives considered in this Draft EIS, allotment management plans are required to employ management strategies compatible with other resources. Since measures such as these would be common to all alternatives, there would be no differences in the nature of the impact of these non-discretionary resources between alternatives.

The actual sustained grazing program would be significantly less than potential due to: (1) demand being significantly less than supply; (2) recreation conflicts (i.e., concentration of livestock in and around popular camping sites and water sources); and (3) unfavorable benefit-cost ratios for range improvement.

Consequences Specific to an Alternative

Each alternative can be evaluated in terms of animal months (AMs), livestock grazing impact, and management intensity needed to protect and/or improve range condition. AMs as used here should not be considered absolute values but as trends in livestock grazing emphasis. With AMs (See **Table IV-7**), the assumption is that if the trend is upward or downward, the number of animals and/or allotments would be increased or decreased, respectively. Actual AMs can vary considerably each year due to changes in climate, forage conditions, and availablity.

Grazing impact is described in terms of high, moderate and low. High impacts assume that essentially all of the available forage (standard of take one-half of current year's growth and leave one-half) would be fully utilized by livestock grazing. Moderate impacts assume that 40 to 70 percent of the forage would be utilized. Low impact assumes that most of the available forage would not be utilized.

Management intensity needed to protect and/or improve range condition is also described in terms of high, moderate and low. High intensity includes such things as riparian corridor fencing, fencing pasture areas, water development, and vegetation planting or seeding. Moderate management intensity may include some fencing and water development, but not as much as high intensity. Moderate intensity would also include considerable herding of livestock to control impacts. Low management intensity would involve some herding of livestock to control range impacts.

Alternative PRF (Preferred Alternative), Alternative CUR (No Action/No Change), and Alternative CBF (Citizens for Better Forestry). Under these alternatives, AMs would basically be the same. Grazing impacts would be moderate on primary and secondary ranges and light to moderate elsewhere including riparian areas. Management intensity would be moderate to high with increased emphasis of riparian area management. Grazing would be phased out of wilderness areas in Alternatives PRF and CBF.

Alternative RPA (1990 RPA Program Emphasis). Under this alternative the AMs would be increased by about 18 percent over current levels. Grazing impacts would be moderate to heavy on primary and secondary ranges and light to moderate on riparian and other remaining areas. Management intensity would be high.

Table IV-7
Animal Months (AMs)
(Average Annual AMs)

Alternative	AMs
PRF (Preferred Alternative)	8,300
RPA (1990 RPA Program Emphasis)	10,000
CUR (No Action/No Change)	8,300
CBF (Citizens for Better Forestry)	8,300

15. RECREATION

Consequences Common to all Alternatives

The current management direction in the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) Management Plan would be carried forward in all alternatives. The proposed Forest Plan would serve as the document to which the NRA Management Plan would be tiered.

Proposed recreation opportunity spectrum (ROS) classes are linked to the management prescriptions assigned to a specific alternative according to the theme of that alternative. Thus, the inventoried ROS has the potential to change from one ROS class to another. Under all alternatives, designated Wildernesses would be managed to the primitive ROS class (includes all inventoried primitive ROS as well as inventoried semi-primitive non-motorized ROS within the Wilderness boundaries).

The emphasis on developing and maintaining partnerships would be common to all alternatives.

The management and protection of resource features which fall within the purview of minimum management requirements (MMRs), (e.g., encompassed by laws and regulations) would be common to all alternatives. These features would have a similar effect on the recreation resources regardless of alternative. For example, proposed recreation activities and improvements, such as off-highway vehicle (OHV) use, and trail and campground construction, would be limited by the existence of significant cultural resource properties, sensitive plant sites, and threatened and endangered species habitats needing protection.

Consequences Specific to an Alternative

Alternative PRF (Preferred Alternative). Alternative PRF would provide developed recreation opportunities adequate to meet estimated demand for the next 50 years. The conceptual organization of the Shasta-Trinity National Forests recreation potential would be framed into theme areas. Twelve geographic recreation theme areas would examine management opportunities over the next five decades. The consequences of this organization would be that unique recreation experiences and activities offered by each theme area would be identified, rather than providing identical activities in all locations. Additional recreation opportunities offered by each theme area, but not currently being used, would be identified and promoted in the 1st and 2nd decades.

Recreation use would increase approximately 50 percent over the next 50 years. Existing developed sites would be rehabilitated at the rate of 8,750 people-at-one-time (PAOT) per decade. New developed sites would be constructed to meet projected demand. Dispersed use would increase approximately 50 percent by the end of the planning horizon.

This alternative would result in no changes from current acreages in the primitive and semi-primitive non-motorized ROS classes. The change in semi-primitive motorized is approximately a 15 percent increase from current. There would be a 15 percent decrease in the roaded natural ROS class, and no change from the current acreages in the rural ROS class.

OHV opportunities would decrease slightly (from the current 243,020 to 239,175 acres) for areas open and usable during the summer. Described another way, Alternative PRF would have 586,609 acres closed, 1,259,688 acres restricted, and 275,250 acres open (includes usable and unusable) to OHV use. This would be offset by an increase in designated OHV travelways.

As a result of timber management activities, hydroelectric projects, and increased use of lake surfaces, there would be a minor decrease in the semi-primitive character of the landscape due to road construction and harvest areas. Resource management activities would be evident but would harmonize with the natural environment. Increased demand for competing winter sports activities and water-oriented recreation activities would lead to a limited amount of use conflicts.

Development of downhill skiing facilities in the Mt. Shasta area would be encouraged to accommodate up to 5,000 skiers-at-one-time (SAOT). A site-specific environmental statement has been completed to examine the environmental effects of this proposal.

Alternative RPA (1990 RPA Program Emphasis). This alternative would provide developed recreation opportunities to meet demand levels through the planning horizon. The conceptual organization of the Shasta-Trinity National Forests recreation potential would be framed into theme areas. Twelve geographic recreation theme areas would examine management opportunities over the next five decades. The consequences of this organization would be that unique recreation experiences and activities offered by each theme area would be identified, rather than providing identical activities in all locations. The difference from Alternative PRF is that additional recreation opportunities offered by each theme area, but not currently being used, would be identified and promoted over the next five decades. Total recreation use by the end of the planning horizon would be approximately 7.3 million recreation visitor days (RVDs).

As in Alternative PRF, this alternative would result in no increases in acreage in the primitive and semi-primitive non-motorized ROS classes. The semi-primitive motorized class would have a slight increase from

inventoried acreage, and there would be a slight decrease in the roaded natural ROS class. There would be no change from current acreages in the rural ROS class.

OHV opportunities would be slightly greater than the current situation (from 243,020 acres to 256,120) for areas open and usable during the summer. In addition, designated OHV travelways would be increased. Alternative RPA would have 543,959 acres closed, 1,259,908 acres restricted, and 317,680 acres (includes usable and unusable) open to OHV use.

There would be some decrease in the semi-primitive character in many areas of the landscape as a result of increasing timber outputs. Resource management activities would be evident but would harmonize with the natural environment.

Downhill skiing in the Mt. Shasta area would be encouraged to accommodate up to 5,000 SAOT with possible future expansion to 13,000 SAOT based on demand. A site-specific environmental statement has been completed to examine the environmental effects of this proposal.

Alternative CUR (No Action/No Change). In Alternative CUR developed recreation opportunities would be adequate to meet demand in the first decades. However, in the remaining decades, the supply of developed recreation opportunities would fall short of demand. The management organization would not be conceptualized into geographic theme areas. Consequences would include a continuation of current management which would attempt to meet all opportunity demands in all areas. There is the possibility that the development of unique opportunities would be missed. Only 20 percent of developed sites would be operated at the standard service level. As the demand for developed sites increases, the midweek period would become more heavily used. The quality of developed recreation use would decline due to cutbacks in maintenance and services. The quality of the recreation experiences would also decline due to the crowded conditions that would exist.

Dispersed recreation activities that are dependent on trail and water use would be emphasized in this alternative due to their more cost-effective nature. The quality of the dispersed recreation experience would decline for some users.

This alternative would result in no changes to the current ROS class acreages.

OHV opportunities would remain as designated in the 1980 Forest OHV Plan, as amended. Designated OHV travelways would increase. Alternative CUR would have 533,310 acres closed, 1,233,033 acres restricted, and 355,200 acres open (including usable and unusable) to OHV use.

As a result of resource management activities requiring road access, there would be some decreases in the semi-primitive character of the landscape. Resource utilization activities would be evident but would harmonize with the natural environment.

Under this alternative, downhill skiing facilities in the Mt. Shasta area would be encouraged to accommodate up to 5,000 SAOT. A site-specific environmental statement has been completed to examine the environmental effects of this proposal.

Alternative CBF (Citizens for Better Forestry). This alternative would provide recreation opportunities adequate to meet estimated demand. Existing developed sites would be rehabilitated at the rate of 1,100 PAOT per decade and new developed sites would be constructed at the rate of 1,050 PAOT per decade. The management organization would not be conceptualized into geographic theme areas. Consequences would include a continuation of current management which would attempt to meet all opportunity demands in all areas. There is the possibility that the development of unique opportunities would be missed. This alternative would result in a slight increase in both the primitive and semi-primitive motorized ROS classes. There would be a significant increase over inventoried acres in the semi-primitive non-motorized ROS class, and a significant decrease in the rural ROS class acres. There would be a slight decrease in roaded natural acreages.

OHV opportunities would be less than the current situation for areas open and usable in the summer (existing 243,020 to 220,195 acres proposed). Described another way, this alternative would have 687,650 acres closed, 1,180,157 restricted, and 253,740 acres open (including usable and unusable) to OHV use. Designated OHV travelways would increase.

This alternative has the least amount of changes of any alternative in semi-primitive characteristics on a large portion of the landscape.

Under Alternative CBF downhill skiing opportunities would be limited. Downhill skiing facilities on Mt. Shasta would be developed to serve a maximum of 1,500 SAOT.

16. RIPARIAN AREAS

Refer to the sections on fisheries and water quality in this chapter for a discussion of environmental consequences associated with riparian areas.

17. SOILS

Consequences Common to all Alternatives

Land management practices, such as timber harvesting, reforestation site preparation, and vegetation type conversion, can affect soil productivity. The removal of vegetation from a site, as in timber harvesting, also removes plant nutrients. Denuding a site for reforestation or type conversion exposes the soil to erosion and leaching of nutrients. Soil compaction by mechanized equipment can reduce root aeration. The direct effect of these site alterations can be the eventual loss of commodity outputs.

Research has shown that timber harvesting and site preparation for reforestation, if done following Soil Quality Standards (SQS) and Best Management Practices (BMPs), result in no significant loss of soil productivity in the short term.[1] The indication is that there is also little or no long-term loss in soil productivity, at least in highly productive sites. If there is a long-term loss of productivity, it would probably be more apparent in low productivity soils. The construction of system roads, however, does remove areas from production.

Consequences Specific to an Alternative

The SQS and BMPs that mitigate soil erosion, compaction, nutrient loss, and organic matter loss would protect soil productivity. They would be employed for each alternative. However, there is still a slight potential that soil productivity can be affected.

Each alternative has a different potential effect on soil productivity. Indicators of this variable effect are best displayed and discussed in terms of management activities that would result in soil disturbance. The indicators used here are acres of timber harvest and acres of road construction.

Compared to a decade ago, fewer acres are being harvested. Clearcutting has been reduced. For example, clearcutting has been reduced from an average of 5,500 acres to 300 acres per year in Alternative PRF. In addition, new standards and guidelines have been implemented which offer greater resource protection for soil quality, including compaction, erosion and productivity, and for riparian areas.

The assumption is that the greater the number of acres harvested, the higher the potential for soil compaction and erosion which would affect soil productivity. Also, more miles of road construction result in more acres of soil taken out of production. **Table IV-5**, under the Geology section of this Chapter, displays the acres of timber harvest and the acres of road construction by alternative. The following discussion considers potential impacts of each alternative in relation to current management, Alternative CUR.

Alternative PRF (Preferred Alternative). This alternative would have about 5,900 acres of timber harvest, or about 39 percent fewer acres than Alternative CUR; thus there would be a slightly lower potential for soil productivity degradation. About 39 acres of land would be taken out of production by road construction each year.

Alternative RPA (1990 RPA Program Emphasis). This alternative would have less potential for adversely affecting soil productivity from Alternative CUR. There would be about 8,890 acres of timber harvest, or about an 8 percent decrease in this alternative over CUR. About 40 acres of land would be taken out of production by road construction each year.

Alternative CUR (No Action/No Change). This alternative would have the greatest risk of adversely affecting soil productivity. There would be an average of about 9,660 acres of timber harvested per year. This timber harvest, and the subsequent reforestation site preparation activities, often expose the soil to potential erosion. Also, in this alternative, about 40 acres of land would be taken out of production by road construction each year.

Alternative CBF (Citizens for Better Forestry). There would be about 5,880 acres of timber harvested, or about 39 percent fewer acres than in Alternative CUR. There would be 28 acres of land removed each year from productivity because of road construction.

1 Analysis of Soil and Site Properties in Paired Clearcut and Uncut Douglas-fir Stands on the Galice Formation, Fox Planning Unit, Six Rivers National Forest; Robert F. Powers and Charles P. Weatherspoon, Pacific Southwest Forest and Range Experiment Station, Redding, CA 96001, January, 1984.

18. SPECIAL AREAS

Research Natural Areas (RNAs)

Consequences Common to all Alternatives

Under all alternatives the established Shasta Mud Flow Research Natural Area (RNA) would be retained. The characteristics of young-growth ponderosa pine stands and the geologic values of a volcanic mud flow would be maintained.

Under all alternatives areas suitable for RNA purposes, but not yet identified, could be lost due to allocation to management prescriptions and uses which would alter the natural vegetation and landscape. This effect would be minimized through early identification of areas which fulfill RNA network requirements. Refer to Appendix F for a complete listing of the target ecosystems needed for the Regional network of RNAs.

Consequences Specific to an Alternative

The impacts related to RNA establishment can be viewed from two aspects: (1) impacts to the RNA program; that is, opportunities gained or lost in reference to RNA targets; and (2) secondary impacts of RNA establishment on other resources.

With reference to the first aspect, areas recommended for RNA establishment vary by alternative. See **Table IV-8** for a listing of recommended RNAs.

Designation of an area as a RNA would also have an impact on the resources located within that RNA. Resource conditions within each RNA are described in Appendix F, **Table F-2.** Some uses would be restricted or prohibited under an RNA designation. For example, all motorized, dispersed recreation uses, developed recreation uses, timber harvesting, road construction, mineral development, and other ground-disturbing activities would be prohibited.

Non-motorized dispersed recreation would be limited to day use. Thus, dispersed camping would be discouraged, if not prohibited. Even day use would be carefully controlled and limited, depending upon the purposes of the RNA and the nature of studies to be conducted within the RNA.

Conversely, the immediate short-range effect of identifying land for RNA purposes would be to prohibit candidate areas from human disturbance associated with land management activities except where specific projects have been initiated.

Alternative PRF (Preferred Alternative). Under this alternative 24,760 acres of National Forest lands in nine candidate RNAs would be established.

Establishment of these areas would meet 9 out of the 34 established RNA targets shown in Appendix F, **Table F-1.** These targets are shared by the Klamath, Lassen, Six Rivers, and Shasta-Trinity National Forests.

Alternative RPA (1990 RPA Program Emphasis). About 13,400 acres of National Forest lands in five candidate RNAs would be established. Four of the five areas are within existing Wildernesses.

Establishment of these areas would meet 5 out of the 34 established RNA targets shown in Appendix F, **Table F-1.** These targets are shared by the Klamath, Lassen, Six Rivers, and Shasta-Trinity National Forests.

Alternative CUR (No Action/No Change). Under this alternative 21,470 acres of National Forest lands in eight candidate RNAs would be established.

Establishment of these areas would meet 8 out of the 34 established RNA targets shown in Appendix F, **Table F-1.** These targets are shared by the Klamath, Lassen, Six Rivers, and Shasta-Trinity National Forests.

Alternative CBF (Citizens for Better Forestry). Under this alternative 26,970 acres of National Forest lands in 13 candidate RNAs would be established.

Establishment of these areas would meet 13 out of the 34 established RNA targets shown in Appendix F, **Table F-1.** These targets are shared by the Klamath, Lassen, Six Rivers, and Shasta-Trinity National Forests.

Special Interest Areas (SIAs)

Consequences Common to all Alternatives

A total of 19 SIAs would be recommended for classification. (See **Table III-14** in Chapter III and **Table IV-10**). If these areas were not classified, they would be exposed to a variety of resource management activities which could have the potential to cause disturbance. Examples of such activities include salvage logging, road building, mining, and drilling associated with geothermal development.

Table IV-9 indicates the relative risks of environmental disturbance that would be involved for each area if they were not classified.

Table IV-8
Recommended Allocation of Research Natural Areas - By Alternative
(Net National Forest Acres**)

Name of Area	Acreage	PRF	RPA	CUR	CBF
1. **Bald Mountain**	800	-	-	-	800
2. **Bear Creek**	4,500	-	-	-	4,500
3. **Cascade**	2,000	-	-	-	2,000
4. *Cedar Basin	1,160	1,160	1,160	1,160	1,160
5. *Devils Rock-Hosselkus	5,550	5,550	-	4,980	5,550
6. *Manzanita Creek	7,250	7,250	7,250	7,250	-
7. **Murphy Glade**	1,260	-	-	-	1,260
8. *Mt. Eddy	890	890	-	890	890
9. *Preacher Meadows	1,850	1,850	1,850	1,850	1,850
10. *Red Butte-Red Fir Ridge	1,640	1,640	1,640	1,640	1,640
11. *Rough Gulch	3,960	3,960	-	2,200	3,960
12. *Smoky Creek	960	960	-	-	960
13. **South Fork Mountain**	1,180	-	-	-	900
14. *Stuart Fork	1,500	1,500	1,500	1,500	1,500
TOTAL	**34,500**	**24,760**	**13,400**	**21,470**	**26,970**
(Number of Areas)	(14)	(9)	(5)	(8)	(13)

* Recommended for establishment.

** These figures do not include the already established Shasta Mud Flow, 3,115 acres.

Impacts resulting from any future potential mineral developments would be mitigated through classification of the areas, followed by mineral withdrawal.

Consequences Specific to an Alternative

Alternative PRF (Preferred Alternative). A total of 19 SIAs would be recommended under this alternative. These areas are: (1) Bigelow Meadow, (2) Black Butte, (3) China Mountain, (4) Cory Peak, (5) Deadfall Basin, (6) Deep Crater, (7) Giant Crater Lava Tube System, (8) Grizzly Peak, (9), Kangaroo Ridge, (10) Little Glass Mountain, (11) Natural Bridge, (12) Paint Pot Crater, (13) Pumice Stone Mountain, (14) Samwel Cave, (15) Scott Mountain, (16) Spatter Cones, (17) Tedoc Mountain, (18) Toad Lake, and (19) Western Azalea.

Recommendation of these areas (6,981 acres total) would cause insignificant impacts on the environment from both a short-term and long-term aspect. There would be an insignificant amount of timber resource outputs and mineral values foregone.

In addition, 22 other areas, which may qualify as SIAs, would be further analyzed for possible classification. Management direction would be provided to evaluate each potential area.

Alternative RPA (1990 RPA Program Emphasis). Thirteen areas, involving 5,458 acres, would be recommended for classification as SIAs under this alternative. Six additional areas would be analyzed for possible classification.

Alternative CUR (No/Action/No Change). Nine of the SIAs recommended in Alternative PRF would be recommended for classification under this alternative. (See **Table IV-10**). However, no additional areas would be analyzed for classification as SIAs.

Alternative CBF (Citizens for Better Forestry). This alternative would recommend 15 areas for SIA establishment: (1) Blake Mountain, (2) Cable Creek, (3) Deep Crater, (4) Giant Crater Lava Tube System, (5) Little Glass Mountain, (6) Lower McCloud River Wild Trout Area, (7) Mt. Shasta Scenic Area, (8) Natural Bridge, (9) Paint Pot Crater, (10) Pumice Stone Mountain, (11) Samwel Cave, (12) Spatter Cones, (13) Tedoc Mountain, (14) Trout Creek Redband Trout Area, and (15) Western Azalea.

Areas not recommended for SIA classification would be available for all other uses. Management activities that may have major impacts to SIAs eliminated from consideration might include:

Grazing. Sensitive biotic communities can be severely disturbed and degraded when they are overstocked with livestock. A lack of management direction in these areas could result in a significant loss of the target habitat.

Timber Harvest. Removal of the vegetation by harvesting could result in disturbance to unique vegetative species or associations typical of some SIAs.

Road Construction. Construction of roads could adversely affect proposed areas. Roading could disturb unique geological areas.

Mining and Geothermal Development. Exploration for and development of mines or geothermal areas could adversely affect all of the areas. Exploratory drilling operations, surface or underground mining excavations, settling ponds, leaching ponds and waste disposal sites would remove vegetation, possibly affect both surface and subsurface drainage, and disturb land surface features.

Off-Highway Vehicle (OHV) Use. OHV use causes soil erosion and compaction and displacement along the vehicle track. Dust on plants can contribute to reduced plant growth. Fragile botanical communities could be damaged by such use.

Mt. Shasta

Consequences Common to all Alternatives

Management direction is already implied for all alternatives in Mt. Shasta's designation as a Wilderness, a National Natural Historic Landmark (NNHL), and a Recreation Area (under the Secretary of Agriculture's 1926 Land Order). In addition, the management direction for Management Areas 3 (Mt. Shasta) and 5 (Forest Wildernesses-Mt. Shasta Wilderness) would be followed in all alternatives.

Consequences Specific to an Alternative

The consequences associated with Mt. Shasta would vary depending on the degree of management emphasis placed upon Mt. Shasta and the surrounding area. As noted above, some emphasis has already been provided through a mixture of administrative and legislative designations.

Alternative PRF (Preferred Alternative). Under this alternative, the Mt. Shasta Management Area (Management Area 3) would be informally designated a Special Management Area in recognition of its unique values. This Management Area would be a single, coordinated unit to focus attention on the Mt. Shasta area as a whole. This informal designation would recognize the many uses and values which abound in the Mt. Shasta area.

Table IV-9
Risk of Disturbance to Special Interest Areas
(if they are not classified)

	Area Name	Risk	
1.	Bigelow Meadow*	G, OHV	+ +
2.	Big Sand Flat	G, L, OHV	+ +
3.	Black Butte*	M, OHV	+
4.	Blake Mountain	G, L, OHV	+ +
5.	Burnt Lava Flow	L, M, OHV	+ + +
6.	Cable Creek	G, L	+ +
7.	China Mountain*	G, L, M, OHV	+ +
8.	Cory Peak*	G, L, M, OHV	+ +
9.	Deadfall Basin*	G, L, M, OHV	+ +
10.	Deep Crater*	M, OHV	+ + +
11.	Del Loma Cave	M, OHV	+ + +
12.	Dobkins/Durney Basin	G, M, OHV	+ +
13.	Dubakella Mountain	M, L, OHV	+ +
14.	Giant Crater Lava Tube System*	L, M, OHV	+ + +
15.	Grizzly Peak*	M, OHV	+
16.	Hall City Cave	L, M, OHV	+ + +
17.	Hirz Mountain	M	+
18.	Kangaroo Ridge*	G, L, M, OHV	+ +
19.	Little Glass Mountain*	M, OHV	+ +
20.	Lower McCloud River	G, OHV	+ +
21.	McCloud Falls	G, L, OHV	+ +
22.	McGinnis Springs/Wagon Camp	G, L, OHV	+ +
23.	Mt. Shasta Scenic Area	G, L, OHV	+ + +
24.	Natural Bridge*	L, OHV	+
25.	New River	G, L, OHV	+ +
26.	Paint Pot Crater*	M, OHV	+ + +
27.	Papoose Hill	M, OHV	+
28.	Potem Falls	L, OHV	+
29.	Potter Creek Cave	M	+ + +
30.	Pumice Stone Mountain*	M, OHV	+ + +
31.	Samwel Cave*	M	+ + +
32.	Scott Mountain*	G, L, OHV	+ +
33.	Spatter Cones*	L, OHV	+ + +
34.	Tedoc Mountain*	G, L, M	+ +
35.	Tilted Rock Lava Flow	L, M, OHV	+
36.	Toad Lake*	G, OHV	+ +
37.	Tombstone Peak Caves and Fossil Locality	M, OHV	+
38.	Trout Creek	G, L, OHV	+ +
39.	Twin Lakes Basin	G, L, OHV	+
40.	Wells Creek Falls	OHV	+
41.	Western Azalea*	L, OHV	+ +

* Recommended for establishment as Special Interest Areas

Key: G = Grazing/Pack Animals; L = Logging Activities; M = Mining/Geothermal Activities; OHV = Off Highway Vehicles; + = Low Risk; + + = Moderate Risk; + + + = High Risk

Table IV-10
Special Interest Areas 'Recommended' for Establishment
Comparison of LMP Alternatives

	Area Name	PRF	RPA	CUR	CBF
1.	Bigelow Meadow	136	136	-	-
2.	Black Butte	560	560	-	-
3.	Blake Mountain				155[1]
4.	Cable Creek				Unspecified[1,2]
5.	China Mountain	680	-	-	-
6.	Cory Peak	280	-	-	-
7.	Deadfall Basin	460	460	-	-
8.	Deep Crater	333	333	333	333
9.	Giant Crater Lava Tube System	179	179	179	179
10.	Grizzly Peak	220	-	-	-
11.	Kangaroo Ridge	190	-	-	-
12.	Little Glass Mountain	1,440	1,440	1,440	1,440
13.	Lower McCloud River Wild Trout Area	-	-	-	Unspecified[1,2]
14.	Mt. Shasta Scenic Area	-	-	-	Unspecified[1,2]
15.	Natural Bridge	64	64	64	64
16.	Paint Pot Crater	444	444	444	444
17.	Pumice Stone Mountain	107	107	107	107
18.	Samwel Cave	20	20	20	20
19.	Scott Mountain	128	-	-	-
20.	Spatter Cones	5	5	5	5
21.	Tedoc Mountain	1,060	1,060	1,060	1,060
22.	Toad Lake	650	650	-	-
23.	Trout Creek Redband Trout Area	-	-	-	Unspecified[1,2]
24.	Western Azalea	25	-	-	5
Total Acres		6,981	**5,458**	**3,652**	**3,812 (+)**
Number of SIAs		19	*13*	*9*	*15*

[1] These five areas are being 'recommended' in Alternative CBF only. Therefore, they are shown as 'potential' SIAs in Table III-16, which reflects Alternative PRF only.

[2] Boundaries have not been set.

Based on this concept, there would be few apparent changes in the outputs of goods and services over the current management situation. However, there would be slightly higher management costs than represented by Alternative CUR. This would be brought about by such things as more intensive signing, additional visitor information services, and multiple resource coordination, tied to a goal which emphasizes Mt. Shasta.

Alternatives RPA (1990 RPA Program Emphasis) and CUR (No Action/No Change). Under these alternatives no changes would be made over the current management emphasis. Therefore, no additional environmental consequences are anticipated.

Alternative CBF (Citizens for Better Forestry). Under this alternative the Mt. Shasta Management Area (Management Area 3) would be designated as a SIA and named the Mt. Shasta Scenic Area. In effect, the area would be recognized specifically for its unique scenic and recreational values. Other unique features would be recognized but not necessarily emphasized. There would be no changes in the management of the areas contiguous to the proposed scenic area boundaries. No environmental consequences would be anticipated for these areas as a result of SIA classification.

19. TIMBER

The consequences of implementing the alternatives are closely related to the public issues. The consequences focus on three basic questions: (1) what lands would be used for timber production?; (2) to what intensity would timber management be practiced on these lands?; and (3) what timber management practices would be applied to these lands? To assess and predict the consequences of each alternative on the timber resource, the following items are addressed:

-- suitable timber land base;

-- timber management intensity on the suitable timber lands;

-- silvicultural and harvest practices;

-- allowable sale quantity (ASQ), long-term sustained yield and growth; and

-- management requirements and mitigation measures.

The conceptual background for these items is given in the next section. That section also describes consequences that are common to all alternatives. Consequences that are specific to an alternative are shown in **Table IV-11** and discussed in the subsequent sections.

Consequences Common to all Alternatives

Suitable Timber Land Base. The production of timber is largely dependent upon the quantity and quality of lands allocated to that use. Using the timber suitability process directed by the National Forest Management Act (NFMA), Shasta-Trinity National Forests personnel have identified about 1,077,800 acres as capable, available, and tentatively suitable for timber production. This represents about 51 percent of the Forests' land base. This is the base from which the suitable timber lands are selected for each alternative.

During the formulation of each alternative, some of the lands originally identified as tentatively suitable were determined to be unavailable or not appropiate for timber production in order to meet the objectives of the alternative. This occurred if the land was (1) assigned to other resource uses that precluded timber management (e.g., wilderness and research natural areas); (2) assigned to other resource uses that limited timber management activities so severely that timber management requirements could not be met (e.g., unroaded non-motorized recreation areas and riparian management zones); or (3) determined not to be cost efficient in meeting timber management objectives over the planning horizon (e.g. non-stocked brushfields). These lands are classified as not suitable or available for timber production under the alternative, and the amount of land in this category varies by alternative.

Spotted owl habitat protection has the most significant effect on the reduction of the suitable timber land base in all alternatives.

Non-stocked lands on tentatively suitable timber land are not included in the suitable timber land base in any of the alternatives.

Removing land that is tentatively suitable from the suitable land base in an alternative reduces the potential allowable timber harvest level. The magnitude of this reduction depends not only on the amount of land removed but also on its relative productivity. Reductions can be mitigated by increasing the intensity of timber management on the remaining suitable acres. The following section discusses this concept.

Timber Management Intensity on Suitable Timber Lands. Timber management intensity on suitable timber lands, for all alternatives, is categorized as regular or marginal.

Regular management is characterized by high to moderate timber yields (70-100 percent of potential) using the appropriate mix of silvicultural practices and intensities to obtain these yields. Reduced yields are due to limitations on silvicultural practices or intensities in order to meet other resource objectives. Marginal management is characterized by minor yields (20 percent of potential), primarily from sanitation/salvage cutting, due to site limitations or resource objectives which severely restrict timber management.

Timber management intensity is determined by the management prescriptions in an alternative. The standards and guidelines in the management prescriptions determine the intensity at which the timber can be managed within those prescription areas. The amount of land allocated to each of the two intensity levels varies between alternatives.

Timber intensities affect the rate at which timber stands can be managed. Cubic foot volume growth of managed stands, with no intermediate thinning yields, culminates at 50 to 80 years of age. Timber stands which exceed this age would not be growing at optimal rates and should be regenerated with a new stand in order to maintain maximum productivity of the site.

Most of the existing timber stands on the Forests are beyond the age of culmination of growth. The rate at which these stands are regenerated and converted to young, faster growing managed stands has a significant effect on harvest levels. This "conversion period" for existing stands would vary between alternatives, due

Table IV-11
Timber Consequences of Each Alternative

		ALTERNATIVE			
	Unit of Measure	PRF	RPA	CUR	CBF
Suitable Timber Land	M Acres*	575.3	638.1	635.8	495.4
Suitable Land by Intensity Class	M Acres				
Intensive / Modified		473.0	537.7	502.8	372.7
Minimal		102.3	100.4	133.0	122.7
Tentatively Suitable Land - Not Suitable Under the Alternative	M Acres	502.5	439.7	442.0	582.4
Silviculture Practices					
Regeneration Cutting-Decade 1	M Acres				
Clearcut		3.0	38.1	31.6	0.0
Green Tree Retention		23.6	9.3	17.8	26.9
Selection		17.6	0.0	3.0	14.0
Reforestation	M Acres				
Total - Decade 1		44.0	47.0	52.0	41.0
Total - Decade 5		44.0	47.0	52.0	41.0
Percent of Forest Reforested After 5 Decades	Percent	10	11	12	10
Timber Stand Improvement					
Total - Decade 1		66.0	71.0	78.0	62.0
Total - Decade 5		66.0	71.0	78.0	62.0
Allowable Sale Quantity	MMBF**				
Average Annual - Decade 1		87.0	112.4	105.9	65.3
Average Annual - Decade 5		95.9	123.9	116.6	66.4
Long-Term Sustained Yield (LTSY)	MMBF	109.6	136.7	127.4	75.3
Growth	MMBF				
Average Annual - Decade 5		164.1	172.8	190.5	101.4
BF/Acre/Year - Decade 5***		285	271	300	205

* M Acres = Thousand Acres
** MMBF = Million Board Feet
*** Board Feet per Acre per Year

primarily to the mitigating requirements and objectives of the alternative.

Alternatives with primary emphasis on timber management would have relatively shorter conversion periods than alternatives which would emphasize wildlife, recreation and aesthetic values. An indication of this is reflected in the number of acres in the younger (0-50 years) age classes.

The rate at which replacement or regenerated stands are allowed to be harvested is another important factor which affects harvest levels. This cutting rate is referred to as the rotation length or age. Replacement stands under timber management prescriptions would be allowed to cycle on varying rotation lengths, depending on the theme and objectives of the alternatives. Rotation lengths for replacement stands usually correspond closely to the conversion periods for existing stands.

The 50-11-40 standard for spotted owls has a significant effect on conversion periods and rotation lengths by limiting the rate at which harvesting can occur on suitable timber lands in all alternatives.

In all of the alternatives, the average size of the trees harvested in the future would generally be smaller than the trees harvested today. This is because most of the trees harvested in the future would be younger than the trees currently being harvested.

Silvicultural and Harvest Practices

Silvicultural Systems (Cutting Practices). The silvicultural systems selected to manage any particular area would be determined through site-specific analysis by an interdisciplinary team. The final prescription would depend on factors such as management objectives, current stand and site conditions, environmental considerations, cost effectiveness, and the desired future condition of the vegetative cover. This standard would apply to all alternatives.

Both even-aged and uneven-aged systems would be used in all alternatives, although the amount of acres managed under each system would vary considerably. See Appendix J for a discussion of the major silvicultural systems and their application.

Regeneration cutting in understocked and poorly-growing stands would be emphasized in all alternatives. Even-aged systems, using clearcutting, green tree retention (GTR), and shelterwood cutting, would be the primary practices used in areas to be managed intensively for timber production, where timber growth and yield is an important consideration. Even-aged systems would normally be appropriate on these areas due to low sensitivity to other resource issues, single-storied stand structures, presence of little or no manageable understory, high incidence of insects and/or diseases, species that are relatively intolerant to shade, steep slopes, and minor risk of regeneration failures.

The amount of clearcutting varies considerably between alternatives. For assessing consequences, projected clearcutting acres for each alternative can be compared against the 1990 Resources Planning Act (RPA) target. The RPA target for the Forests is to reduce the amount of clearcutting by at least 14 percent from the base year in the 1st decade of the proposed Forest Plan. For the base year (1984-1990) an average of about 8,700 acres per year was clearcut. All alternatives meet this target.

GTR would be employed in all alternatives. GTR would normally leave an average of about 6 to 12 trees per acre which are larger than the mean diameter of the stand. These trees would be retained throughout the life of the newly regenerated stand. This practice would result in a yield reduction of about 15-30 percent compared to pure clearcutting due to the loss of volume in the green trees retained and the shading effect of the reserve trees on the newly regenerated stand.

Uneven-aged systems, using selection cutting, would be employed in all alternatives where other resource objectives are emphasized and a continuous tree cover is desired. Average per acre timber yields from regenerated stands under uneven-aged systems are projected to be about 10 to 20 percent less than under even-aged systems, due to the effect of shading and competition from surrounding trees. Management costs per acre are also predicted to be 10 to 20 percent higher under an uneven-aged system due to smaller openings.

Overstory removal cutting in two-storied stands, with scattered overstory and a fully stocked understory, would be a silvicultural option in all alternatives.

Intermediate commercial thinnings in overstocked stands would be practiced in all alternatives. Stand maintenance (sanitation/salvage cutting) would be the primary practice used in areas where marginal management is specified.

All cutting practices, including clearcutting, would be considered on about 85 percent of the tentatively suitable timber land base. Cutting practices on the remaining 15 percent would be limited to methods other than clearcutting due to artificial regeneration limitations. These areas include high elevation red fir, soils with low site productivity, soils with high rock content, and soils with poor water holding capacity.

From a growth and yield standpoint, clearcutting and shelterwood cutting produce the highest timber outputs. Therefore, alternatives with a larger proportion of acres in these practices would produce the highest ASQ.

The major environmental consequences related to silvicultural systems are biological (i.e., productivity, species diversity, etc.) and managerial (i.e., costs, scenic quality, watershed and soils, etc.). These are discussed in detail in Appendix J, Major Silvicultural Systems and Their Application.

Reforestation. Most of the reforestation activities in all alternatives would occur as a result of regeneration cutting of timber stands. Regeneration cutting by clearcutting, GTR, shelterwood cutting and selection cutting would be needed to optimize progress toward a regulated forest. Regeneration cutting is necessary to increase the long-term productivity of the land by replacing older, slow-growing stands with young, fast-growing stands. Reforestation activities would include site preparation and planting in all alternatives.

Successful reforestation depends on a number of factors, including but not limited to the following: (a) adequate and timely site preparation; (b) good planting stock; (c) proper stock handling; (d) good planting job; and (e) seedling protection after planting. The risk of failure would be greatest under those alternatives requiring the most reforestation.

Regenerated stands would vary in size in all alternatives. Clearcut, GTR, and shelterwood openings would generally be 2 to 20 acres in size. Selection cutting openings would be less than two acres.

Existing stand structures (proportion of species, tree sizes, and ages) would be altered under all alternatives where regeneration cutting occurs.

Existing tree species would be maintained in all alternatives. Diversity of tree species, indigenous to an area, would be assured by application of the following standards in all alternatives: (a) an appropriate mix of tree species would be planted in areas to be artificially regenerated; (b) the regeneration of both shade tolerant and intolerant tree species would be encouraged in areas to be naturally regenerated; and (c) manageable, salvable, advanced reproduction would be left in areas planned for regeneration cutting.

The planting of a mix of species native to the area, plus the addition of natural regeneration of species common to the area, would ensure against a monoculture situation. Planting of Douglas-fir, white and red firs, cedars, sugar pine, and ponderosa and Jeffrey pines would continue under all alternatives. The more shade-intolerant species, such as ponderosa pine and Douglas-fir, would be the primary species planted.

Replacement of the more shade-tolerant species, such as white and red firs, and cedars would rely more on natural regeneration, since these species can regenerate and survive in the shade of the other tolerant species and brush. Maintaining a mix of native tree species is consistent with current reforestation practices. No major changes would be anticipated in any of the alternatives.

Opportunities to reforest suitable timber lands which are non-stocked with conifers (e.g. brushfields) would be considered, but not emphasized, under any of the alternatives. Minor acreages of non-stocked lands may be converted to conifers under any of the alternatives.

The amount of reforestation varies by alternative. For assessing consequences, projected reforestation (planting) acres can be compared against the historical level of reforestation activity over the last nine years, and the percent of the Forests' acres that would be reforested over the next five decades.

The actual reforestation acres accomplished from 1984 through 1992 averaged about 9,500 acres per year on the Forests.

Timber Stand Improvement (TSI). Substantial TSI work, including release from competing vegetation and precommercial thinning, would be practiced under all alternatives. The amount of acres treated would vary between alternatives.

Most of the TSI activities would occur within areas which have been reforested (plantations). TSI is often necessary to assure plantation establishment and to maintain growth and vigor of regenerated stands. Maintaining trees in a healthy, vigorous condition is also the best defense against insect and disease damage. The control of competing vegetation and proper stocking through release and thinning would foster these conditions under all alternatives.

A full range of vegetation management methods must be made available to successfully treat competing vegetation. These methods include manual, mechanical, prescribed fire, biological, and chemical (herbicide) methods as well as grazing. Herbicides would be available for use in all alternatives, except Alternative CBF. Herbicide use would be limited to those situations where it is essential to achieve the desired land management objectives.

The effects on timber yields and costs due to restrictions on herbicide use are discussed in Chapter II. If herbicide use is restricted, yields would be less and costs would be more.

The consequences of the alternatives on TSI work can be assessed by comparing the projected acres of TSI with the historical level of TSI activity over the past five years. The actual TSI acres accomplished from 1988 through 1992 averaged about 8,000 acres per year on the Forests.

Allowable Sale Quantity and Long-Term Sustained Yield and Growth

Allowable Sale Quantity (ASQ). The ASQ is the maximum amount of timber that may be scheduled for sale from the suitable land base. Although it is expressed as an average annual quantity, ASQ actually applies on a decade basis, because the amount of timber sold each year may vary. The ASQ is determined by the amount of suitable land, the management intensity applied to those lands, and the silvicultural practices applied.

The principle of non-declining yield applies in all alternatives. This requires that the ASQ for any decade must be equal to or greater than that of the previous decade.

Yields from hardwoods are not included in the ASQ in any of the alternatives. Hardwoods would not be managed for commercial timber purposes (sawlogs). However, utilization of hardwoods which are by-products of commercial conifer sales would be permitted under all alternatives.

One of the measures used to assess the consequences of an alternative on the ASQ is to compare the proposed ASQ with the actual volume sold under the old Timber Management Plan. The actual volume sold from 1975 through 1992 averaged about 200 MMBF per year.

Another measure used to assess the consequences of an alternative on the ASQ is to compare the proposed ASQ with the timber targets (timber offered) from RPA. The RPA timber target is 195 MMBF per year in the first decade of the Plan.

The 1990 RPA targets for timber offered in the first decade would not be attained under any of the alternatives. This is because the target was based on projected plans prior to the listing of the northern spotted owl as a threatened species.

The wildfires of 1987 had a negligible effect on ASQ, since most of the inventory on suitable lands was salvaged and most of these burned-over areas were reforested in a timely manner.

Finally, timber yields from the remaining suitable timber land base are often reduced due to other resource requirements, such as wildlife habitat, visual objectives, and riparian areas, in response to minimum management requirements (MMRs) and forest issues.

The attainment of the 1990 RPA timber target would require a significant increase in the suitable timber land available for timber production, and/or a relaxation or elimination of requirements which limit timber yields from suitable lands.

Long-Term Sustained Yield (LTSY). The LTSY is the highest wood yield that may possibly be sustained from lands managed for timber production. It is a function of the amount of suitable timber land, the productive capacity of that land, and the management intensity applied thereon. Like the ASQ, LTSY would normally be higher for alternatives with more land managed under intensive timber management. The ASQ approaches, but does not reach, the LTSY during the 160 year planning horizon in any of the alternatives.

Growth. Due to a relatively large existing timber inventory on the Forests, it is possible to harvest more timber than is grown for quite a few decades. However, growth exceeds harvest in all decades in all alternatives. This is due to numerous constraints on the amount of timber that can be harvested (e.g. 50-11-40 rule for the spotted owl). Growth must equal or exceed the amount harvested in all alternatives in order to maintain timber yields over time. Future growth can be improved by regenerating existing understocked or poorly-growing stands.

One of the measures of growth is to compare the average total growth per year in the fifth decade on the suitable timber lands in each alternative. Alternatives with higher annual growth would produce higher, sustainable timber volumes over time.

Another measure of growth is the average annual growth per acre in the 5th decade. Alternatives with higher growth per acre have higher quality timber land (i.e. more productive land) in their timber land base.

Management Requirements and Mitigation Measures

The Pacific Southwest Region's (Region 5) minimum management requirements (MMRs), minimum implementation requirements (MIRs), and timber policy requirements, as well as the Forests' management requirements which are common to all alternatives, constitute the mitigation measures which would be applied under all of the alternatives considered. Refer to Chapter II and Appendix B in this Draft EIS for a detailed description of these requirements. These basic mitigation requirements would affect the allocation and scheduling of timber lands with resulting impacts on timber resources, outputs, and costs in all the alternatives.

About 40 percent of the tentatively suitable timber land base would be removed from the timber base and classified as unsuitable for timber production in all alternatives due to these minimum requirements.

Additionally, mitigation measures would be reflected in the management emphasis on resources such as riparian management zones, wildlife habitats, and visually sensitive areas on suitable timber lands. The effect of these requirements on the timber resource would vary

significantly between alternatives based on the theme of each alternative.

Consequences Specific to an Alternative

Each alternative has its own unique timber land allocation and timber harvest schedule, establishing the amount, sequence, and rate at which stands would be harvested. The alternative harvest schedules are choices in balancing current wants and demands between competing uses, in response to public issues.

Alternative PRF (Preferred Alternative). This alternative would produce moderately high timber outputs compared to the other alternatives. It would have an ASQ of 87 MMBF per year. This is the third highest harvest level of all the alternatives. This ASQ would be 57 percent less than the average annual volume sold over the last 18 years.

In this alternative, an additional 6 percent of the tentatively suitable timber land base would be removed and classified as unsuitable for timber production due to allocations to prescriptions with no scheduled timber outputs. The primary prescriptions affecting this reduction in the timber base are: (1) unroaded non-motorized recreation, (2) riparian management zones along perennial streams, and (3) sensitive wildlife species.

About 45 percent of the suitable timber land under this alternative would be managed at less than full intensity for timber. The primary factors causing this reduction are: (1) maintenance of visual quality along sensitive roads and recreation areas; (2) maintenance and enhancement of wildlife habitat for game species, and (3) protection of riparian management zones along intermittent streams.

Regeneration cutting would occur on about 7.6 percent of the suitable timber land in the 1st decade. Clearcutting would be the primary cutting practice used on about 5 percent of the total acres harvested in the 1st decade. This is about 44 percent less than current practices.

The average annual acres to be reforested in the 1st decade would be about 54 percent less than the average annual acres reforested on the Forests over the last nine years. In 50 years about 10 percent of the forest would consist of stands which are less than 50 years of age.

This alternative has the third highest LTSY capacity of all the alternatives, exceeded by Alternatives RPA and CUR.

Average annual growth in the 5th decade would be moderate, exceeded by Alternatives RPA and CUR.

Alternative RPA (1990 RPA Program Emphasis). This alternative would produce the highest timber outputs of all the alternatives. It would have an ASQ of 112.4 MMBF per year. This would be about 44 percent lower than the average annual volume sold over the last 18 years.

This alternative would not meet the 1990 RPA timber target. However, it would come closer to meeting this target than any of the other alternatives.

In this alternative, an additional one percent of the tentatively suitable timber land base would be removed and classified as unsuitable for timber production due to allocations to prescriptions with no scheduled timber outputs. The primary prescriptions affecting this reduction in the timber base are: (1) research natural areas, (2) dispersed recreation sites, and (3) bitterbrush areas for wildlife.

This alternative has the most acreage allocated to intensive timber management of all the alternatives. About 25 percent of the suitable timber land would be managed at less than full intensity for timber. This is the least amount of any of the alternatives. The primary factors causing this reduction are: (1) maintenance of visual quality along sensitive roads and recreation areas, and (2) maintenance and enhancement of wildlife habitat for game species.

Regeneration cutting would occur on about 7.4 percent of the suitable timber land in the 1st decade. Clearcutting would be the primary cutting practice used on about 43 percent of the acres harvested in the 1st decade. This is about 6 percent lower than current practices, and the highest of all the alternatives.

The average annual acres to be reforested in the 1st decade would be about 51 percent less than the average annual acres reforested over the last nine years. In 50 years about 11 percent of the Forests would consist of stands which are less than 50 years of age.

This alternative has the highest LTSY capacity of all the alternatives.

Average annual growth in the 5th decade would be relatively high, exceeded only by Alternative CUR.

Alternative CUR (No Action/No Change). This alternative would produce moderately high timber outputs compared to the other alternatives. It would have an ASQ of 105.9 MMBF per year. This is the second highest harvest level of all the alternatives, and would be about 47 percent less than the average annual volume sold over the last 18 years.

In this alternative, an additional one percent of the tentatively suitable timber land base would be removed from the timber base and classified as unsuitable for timber production due to allocations to prescriptions with no scheduled timber outputs. The primary

prescriptions affecting this reduction in the timber base are: (1) research natural areas; (2) bitterbrush areas for wildlife; and (3) dispersed recreation areas.

About 37 percent of the suitable timber land would be managed at less than full intensity for timber. The primary factors causing this reduction are: (1) maintenance of visual quality along sensitive roads and recreation areas; (2) maintenance and enhancement of wildlife habitat for game species; and (3) protection of riparian management zones along perennial and intermittent streams.

Regeneration cutting would occur on about 8.2 percent of the suitable timber land in the 1st decade. Clearcutting would be the primary cutting practice used on about 33 percent of the acres harvested in the 1st decade. This is about 16 percent lower than current practices.

The average annual acres to be reforested in the 1st decade would be about 45 percent lower than the average annual acres reforested on the Forests over the last nine years. This is the highest of all the alternatives. In 50 years about 12 percent of the Forests would consist of stands which are less than 50 years of age.

This alternative has the second highest LTSY of all the alternatives.

Average annual growth in the 5th decade under this alternative would be the highest of all the alternatives.

Alternative CBF (Citizens for Better Forestry). This alternative would produce moderately low timber outputs compared to the other alternatives. It would have an ASQ of 65.3 MMBF per year. This would be about 68 percent less than the average annual volume sold over the last 18 years.

In this alternative, an additional 14 percent of the tentatively suitable timber land base would be removed and classified as unsuitable for timber production due to allocations to prescriptions with no scheduled timber outputs. The primary prescriptions affecting this reduction are: (1) unroaded non-motorized recreation allocated to many former roadless areas; (2) retention of old-growth habitat for wildlife; and (3) riparian management zones along perennial and intermittent streams.

This alternative has the least acreage allocated to intensive timber management of all the alternatives.

About 47 percent of the suitable timber land would be managed at less than full intensity for timber. The primary factors causing this reduction are: (1) maintenance of visual quality along sensitive roads and recreation areas; and (2) maintenance and enhancement of wildlife habitat for game species.

Restrictions on the use of clearcutting and the non-use of herbicides would also reduce timber outputs. Regeneration cutting would occur on about 8.3 percent of the suitable timber land in the 1st decade. Clearcutting would not be practiced in this alternative.

The average annual acres to be reforested in the 1st decade would be about 57 percent less than the average annual acres reforested over the last nine years. In 50 years about 10 percent of the Forests would consist of stands which are less than 50 years of age.

This alternative has the lowest LTSY of all the alternatives.

Average annual growth in the 5th decade would be the lowest of all the alternatives.

20. VISUAL QUALITY

Consequences Common to all Alternatives

In all alternatives, the most highly used areas of the Forests would be managed for scenic quality. Examples include the Shasta and Trinity Units of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA), candidate state scenic highways, riparian zones, developed recreation sites, townsites, and highly used dispersed recreation areas.

Visual Objectives in the National Recreation Area. The two units of the NRA would be managed to conserve the scenic values contributing to public enjoyment. Management activities such as road construction, development of recreational facilities, timber harvest, etc., are either not scheduled or would be accomplished in a manner which would conserve the scenic nature of the area.

Riparian Areas. Riparian areas near major water features, such as lakes and perennial streams, would retain a near natural appearance.

Visual Corridors. The foreground and middleground of several candidate state scenic highways would be managed for scenic quality. These highways include all of U.S. Highway 97, State Highway 3, State Highway 89, and portions of State Highway 36 and Interstate 5. In addition, State Highway 299 and the remaining portions of State Highway 36 and Interstate 5 would be managed for scenic quality in the foreground in all alternatives. Management of the middleground, along these additional roads, would differ significantly between alternatives. All alternatives, except Alternative RPA, would also provide visual resource protection in the foreground of roads.

Developed Recreation Areas. Most developed recreation areas would be managed to maintain a natural or near-natural appearance in the foreground.

Wildernesses. Wildernesses would be managed to maintain as near a natural landscape appearance as possible. Minimal management activities, such as trail building and maintenance, would occur inside wilderness boundaries.

Wild and Scenic Rivers. The foreground of wild and scenic rivers would be managed to maintain a natural or near natural appearance.

Special Areas. Research Natural Areas, Special Interest Areas, special wildlife habitats and significant cultural resource areas would be managed to maintain a natural appearance.

Visual Appearances Outside Heavily Used Recreation Areas, Wilderness and Special Areas. Timber harvesting, road construction, and other resource management activities would occur on a small portion of the land base when compared with historic levels. These activities would be moderately visible from low sensitivity travel routes. The contrast between soil color and vegetation would be very apparent where heavy vegetative manipulation occurred. Smaller openings would lessen this effect. Vegetative patterns would become more mosaic and vegetative sizes would appear more diverse than at present. In some areas, site preparation activities and roads could create continuous unnatural linear patterns on the landscape.

In other large, contiguous areas where soil productivity is low, management activities would generally be limited to occasional road construction, timber salvage, and vegetative manipulation for wildlife purposes. In most cases, these activities would not dominate the landscape.

The direct environmental effects on the visual resource include some change in visual appearance of the landscape in some areas of the Forests outside the Wildernesses. These changes would be created by managed activities implemented to different visual quality levels. The rate of implementation, quantity, and visual quality objectives (VQOs) applied would create different long-term and short-term impacts.

Consequences Specific to an Alternative

Visual Quality Objectives (VQOs). As a whole, the degree of natural appearance of the Forests would vary between alternatives. The distribution of adopted VQOs between alternatives is shown in **Figure IV-2.**

The geographic distribution of VQOs dictates the visual appearance that different types of visitors would observe. VQO acreages shown in the figures and tables are estimates. For specific designation refer to VQO maps. A map packet accompanies this document.

Impacts on Distinctive Landscapes. Distinctive landscapes (Variety Class A) would be affected differently under each alternative. It is estimated that distinctive landscapes would be managed to the visual quality levels shown in **Figure IV-3.**

Visual Condition and Visual Quality Indices. The existing visual condition of the Forests is a benchmark from which an estimate can be made of the effects on, and the rate of change to the landscape.

The Visual Quality Index (VQI) is one measure used to compare the impacts of the alternatives on visual resources in relation to existing visual condition. Ratings were assigned according to research-based assumptions of

Figure IV-2
Adopted Visual Quality Objectives (VQOs)

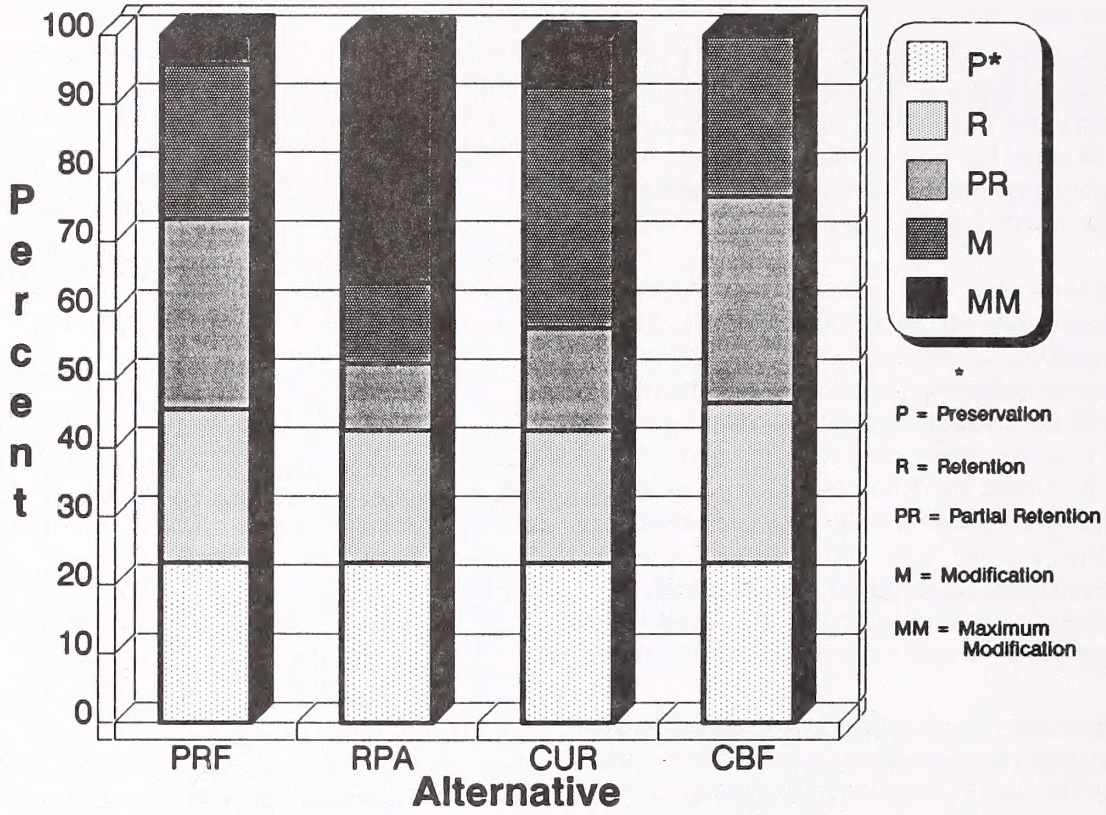
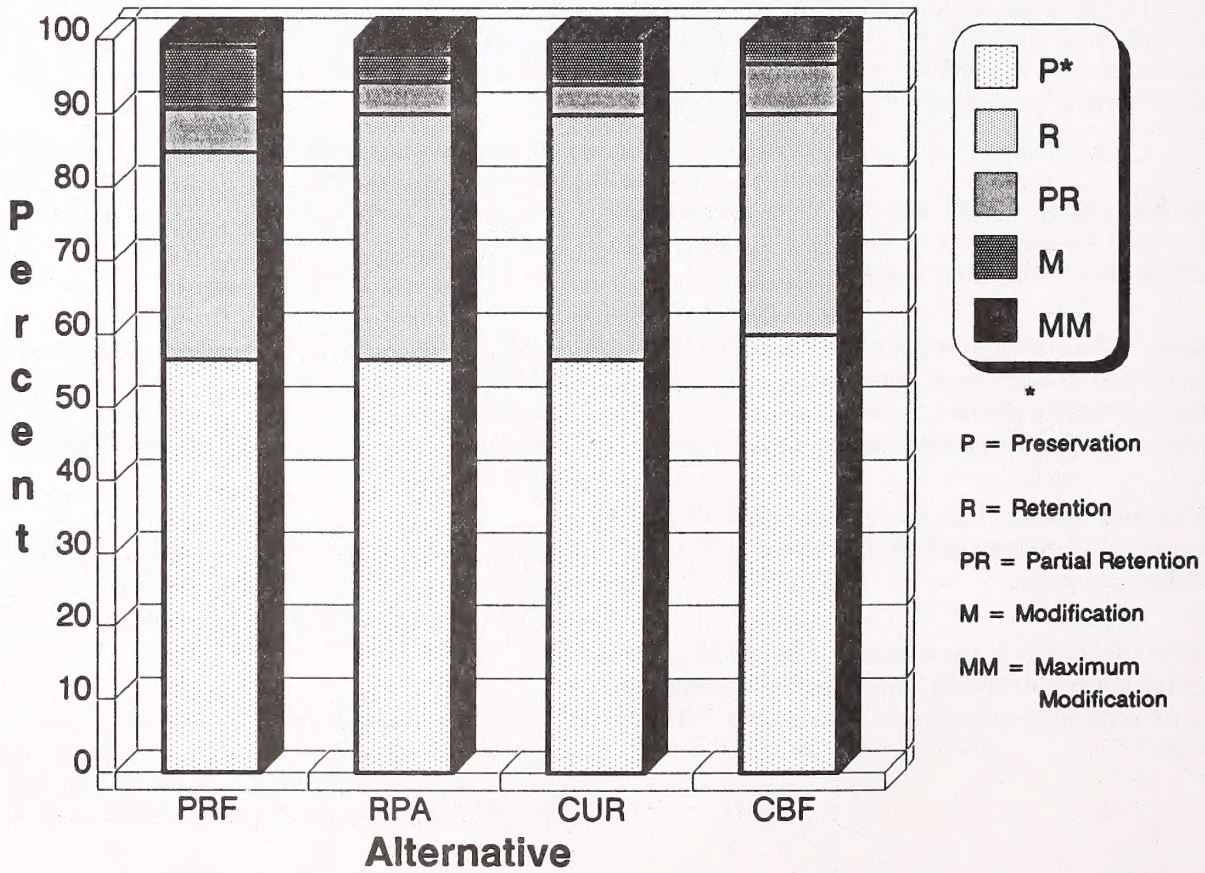


Figure IV-3
Estimated VQOs in Class "A" Landscapes



public preferences for certain categories of landscapes. Refer to the Glossary for details. Also refer to Chapter II for a discussion of the comparative impacts of the alternatives on visual quality using VQI as a parameter.

It is estimated that the overall visual quality of the Forests would increase from the existing visual conditions in all alternatives.

Visual Rehabilitation. The existing visual conditions of some areas on the Forests would not meet the visual condition level proposed for those areas in the alternatives. As a result, visual rehabilitation would be required to bring those areas into conformance with proposed visual quality levels. Visual rehabilitation could take the form of natural vegetative growth or it could require active measures to correct a problem.

Direct and Indirect Effects. On areas to be conserved in a near-natural appearance, management expenses would increase due to reduced harvest unit size, increased initial roading and fuel management costs. More protection would be given to the visual quality and maintaining recreation settings in a near natural state.

Indirect effects of areas managed to visual standards of Modification (M) and Maximum Modification (MM) would include a change from near natural to one where management activities are evident but appear natural.

Alternative PRF (Preferred Alternative). The VQI would increase 18.9 percent from its present level (as measured from existing level of 127.3 to the maximum level of 149.9).

This alternative would protect fewer miles of road in the foreground and middleground than Alternative CBF. Visual transitions between the candidate state scenic highway travel corridors and the more remote areas of the Forests would be gradual. Transitions between the foreground of most other travel corridors and the more remote areas would be more abrupt. Interstate 5 would be managed for a near natural appearance in the foreground. In the middleground, management activities would dominate the landscape.

More miles of wild and scenic rivers would be protected than in Alternatives CUR or RPA. This alternative provides for more semi-primitive landscape settings than Alternatives CUR or RPA. Less of the landscape would be subject to MM visual standards than in Alternatives CUR and RPA.

Overall, this alternative provides more protection for the visual resource than any other alternative. **Table IV-12** summarizes some of the significant information about this alternative.

Alternative RPA (1990 RPA Program Emphasis). The VQI would increase 3.9 percent from its present level (as measured from the existing level of 127.2 to the maximum of 149.9).

Visual transitions between the candidate state scenic highway travel corridors and the more remote areas of the Forests would be gradual. Transitions between the foreground of most other travel corridors and the more remote areas would be more abrupt.

This alternative would protect fewer miles of wild and scenic rivers, fewer acres of semi-primitive landscape setting, and would produce more acres of MM VQOs than any other alternative.

Overall, the landscape quality for this alternative and Alternative CUR would increase at the lowest rate of all alternatives. **Table IV-13** summarizes some of the important visual quality information about this alternative.

Alternative CUR (No Action/No Change). The VQI would increase 3.9 percent from its present level (as measured from the existing level of 127.2 to the maximum level of 149.9).

Visual transitions between the candidate state scenic highway travel corridors and the more remote areas of the Forests would be gradual. This alternative would provide for more protection in the foreground of travel corridors than Alternatives PRF and RPA.

Fewer miles of wild and scenic rivers would be protected in this alternative than in Alternative PRF. A less semi-primitive landscape setting would occur in this alternative than in Alternatives PRF and CBF.

Overall, this alternative and Alternative RPA provide the lowest increase in protection for the visual resource. **Table IV-14** summarizes some of the important information about this alternative.

Alternative CBF (Citizens for Better Forestry). The VQI would increase 18.5 percent from its present level (as measured from the existing level of 127.2 to the maximum of 149.9).

Visual transitions between the candidate state scenic highway travel corridors and the more remote areas of the Forests would be gradual. Transitions between the foreground of most other travel corridors and the more remote areas would also be gradual.

More miles of wild and scenic rivers would be protected than in any other alternative. This alternative provides more semi-primitive landscape settings than any other alternative. Natural appearing landscape settings would be wider in riparian areas than in any other alternative.

None of the landscape would be subject to MM visual quality standards.

Overall, this alternative provides less protection for the visual resource than Alternative PRF but more than Alternatives RPA and CUR. **Table IV-15** summarizes some of the significant information about this alternative.

Table IV-12
Visual Resource Summary
-Alternative PRF-
(Preferred Alternative)
(M Acres)

Visual Condition Class	Existing Visual Condition	Future Visual Condition
I	909.1	498.7
II	1,006.6	467.1
III	125.4	356.2
IV	61.1	679.6
V	19.3	119.9
VI	0.0	0.0
Existing Visual Quality Index		127.2
Future Visual Quality Index		131.5
Visual Rehabilitation (M Acres)		116.5

Table IV-13
Visual Resource Summary
-Alternative RPA-
(Preferred Alternative)
(M Acres)

Visual Condition Class	Existing Visual Condition	Future Visual Condition
I	909.1	498.7
II	1,006.6	400.3
III	125.4	200.3
IV	61.1	251.1
V	19.3	771.1
VI	0.0	0.0
Existing Visual Quality Index		127.2
Future Visual Quality Index		128.1
Visual Rehabilitation (M Acres)		123.3

Table IV-14
Visual Resource Summary
-Alternative CUR-
(Preferred Alternative)
(M Acres)

Visual Condition Class	Existing Visual Condition	Future Visual Condition
I	909.1	498.7
II	1,006.6	405.4
III	125.4	328.8
IV	61.1	742.8
V	19.3	145.9
VI	0.0	0.0
Existing Visual Quality Index		127.2
Future Visual Quality Index		129.8
Visual Rehabilitation (M Acres)		111.8

Table IV-15
Visual Resource Summary
-Alternative CBF-
(Preferred Alternative)
(M Acres)

Visual Condition Class	Existing Visual Condition	Future Visual Condition
I	909.1	506.4
II	1,006.6	492.6
III	125.4	638.0
IV	61.1	484.5
V	19.3	0.0
VI	0.0	0.0
Existing Visual Quality Index		127.2
Future Visual Quality Index		131.4
Visual Rehabilitation (M Acres)		149.4

21. WATER

Water Quality

The indicators used to describe the effects of the alternatives on water quality are the extent of ground disturbing activities, impacts to watershed condition, and soil and water resource improvement. Assumptions are: (1) the lower the level of ground disturbing activities, the lower the risk of degrading water quality; (2) the lower the level of cumulative impacts within a watershed, the lower the effect on watershed condition; and (3) the greater the number of acres of soil and water resource improvement, the greater the level of water quality improvement.

Consequences Common to all Alternatives

Riparian Area and Streamcourse Protection. On the Shasta-Trinity National Forests, riparian areas are an extremely important, yet limited, portion of the land base. They are used by many species of resident and transient wildlife. Riparian areas are desirable for developed and dispersed recreation; they are highly productive forage and timber areas, and they represent the most diverse vegetative conditions on the Forests. Forest standards and guidelines, land allocation constraints, Best Management Practices (BMPs), and supplemental management area direction assures that each of the alternatives would protect the riparian areas and streamcourses on the Forests.

Soil and Water Resource Improvement. By the most recent estimates there are approximately 11,800 acres of degraded watersheds, as a result of past disturbance, that can be effectively treated on the Forests. The 1990 RPA targets for watershed improvement on the Forests are to restore 700 acres per year during the 1st decade, 710 acres per year during the 2nd decade, and 450 acres per year during the 3rd decade. Implementing the target rate on the watershed improvement needs identified to date would result in complete watershed restoration sometime during the 2nd decade. Actual rates of implementing identified improvements would occur commensurate with funding regardless of the alternative chosen. A more extensive and complete inventory is needed, however, to identify all areas within deteriorated watersheds that are in need of improvement.

Restoration of degraded watershed areas would have several direct effects on the environment: (1) erosion would be reduced and, therefore, productivity stabilized; (2) commodity production potentials would be increased; (3) State Water Resource Control Board Management Agency Agreement commitments would be met; (4) visual quality would be enhanced; and (5) inland and anadromous fish habitat would be stabilized or improved by reduced sedimentation.

Consequences Specific to an Alternative

Ground Disturbing Activities

In order to disclose the potential effects of each alternative on water quality, the following indicators will be used:

--Acres of fuel treatment for timber planting site preparation and wildlife habitat improvement. In using this indicator, the assumption is made that as the acres of fuel treatment increase, the potential for riparian area and streamcourse damage also increases. Broadcast burning within riparian management zones (RMZs) is not allowed in any alternative which further protects riparian areas and streamcourses. (See **Table IV-16.**)

--Miles of new road construction. This indicator is expressed as the average miles of new road constructed per year (averaged over a 5 decade planning period) for each of the alternatives. The assumption used is that as more roads are built there would be a greater risk to water quality degradation. Risks are minimized, however, by excluding any road construction within RMZs and by using a full range of road construction strategies related to BMPs.

Table IV-16
Average Annual Fuel Treatment and Wildfire Acres
(First Decade [in acres])

Alternative		Treatment	Wildfire	Total
PRF	(Preferred Alternative)	6,480	11,000	17,480
RPA	(1990 RPA Program Emphasis)	6,580	11,000	17,580
CUR	(No Action / No Change)	7,080	15,000	22,080
CBF	(Citizens for Better Forestry)	5,880	11,000	16,880

--Timber harvested area. This indicator combines four types of harvesting methods and places an adjustment weight on each. The weights are used to compensate for the relative amount of ground disturbing activity associated with the method. Clearcut acres are given a weight of 1.0, green tree retention acres on slopes over 40 percent are given a weight of 0.8, green tree retention acres on slopes less than 40 percent have a weight of 0.4, and group selection harvesting also has a weight of 0.4. All methods were totalled for the purposes of alternative comparison.

Alternative PRF (Preferred Alternative). This alternative would have a lower potential for adverse effects to water quality than Alternative CUR. Total fuel treatment would average 6,480 acres per year. This is 8 percent less than the total expected for Alternative CUR (7,080 acres). New road construction would average 22 miles per year. Total weighted harvest activity planned for this alternative is 2,892. This amount is 28 percent less than the weighted harvest activity planned for CUR.

Alternative RPA (1990 RPA Program Emphasis). This alternative would have the next to highest potential for degradation of water quality. It is lower than Alternative CUR because of the change in emphasis in more recent RPA plans, with less emphasis on commodity production. Total fuel treatment averages would amount to 6,580 acres, 7 percent less than the amount planned for CUR (7,080 acres). New road construction would actually be the same for this alternative as for CUR, averaging 23 miles per year. This alternative plans for a total weighted harvest activity of 3,812, 6 percent less than the activity planned for CUR.

Alternative CUR (No Action/No Change). With the implementation of this alternative's management practices, an annual average of about 7,080 acres of National Forest land would be treated or burned. These activities would pose a risk of water quality degradation that would have to be mitigated. Possible effects could be temporary accelerated erosion with delivery of sediment to water courses. Other potential effects of burning could be: loss of aquatic and wildlife cover, loss of streamside temperature control shade, and degradation of aquatic habitat.

Alternative CBF (Citizens for Better Forestry). This alternative represents the least risk of all alternatives to potential water quality degradation. Under this alternative the average annual acreage of total fuel treatment would be 5,880 acres. This amount is 17 percent less than the amount planned under Alternative CUR (7,080 acres). Yearly road construction for this alternative is planned at 15 miles per year, averaged over a 50 year planning period. This represents 29 percent fewer roads than CUR. Total harvested area, as determined by the weighting methodology, is only 1,607, or 60 percent less than CUR.

Watershed Condition

For each alternative the status of watershed condition classes was determined through evaluation of cumulative watershed effects. Refer to procedures discussed in Appendix H. Watershed acres in each watershed condition class were calculated and plotted for decades 1 and 5. **Figure IV-4** includes five separate bar charts which illustrate these trends for each of the alternatives.

By using Alternative CUR as a reference of the existing situation at decades 1 and 5, each of the alternatives can be compared to one another. Additionally, **Table IV-17** lists the number of watersheds in each watershed condition class for decades 1 and 5.

For each alternative, the status of watershed condition classes would change over time. Some watersheds in class 1 condition (generally good to excellent) would change to class 2 (generally fair to good). In two alternatives, some watersheds would change to class 3 (generally fair to poor). Experience indicates that as more watersheds decline to watershed condition class 2, the greater the potential for watershed degradation within some subwatersheds. Additionally, watersheds which

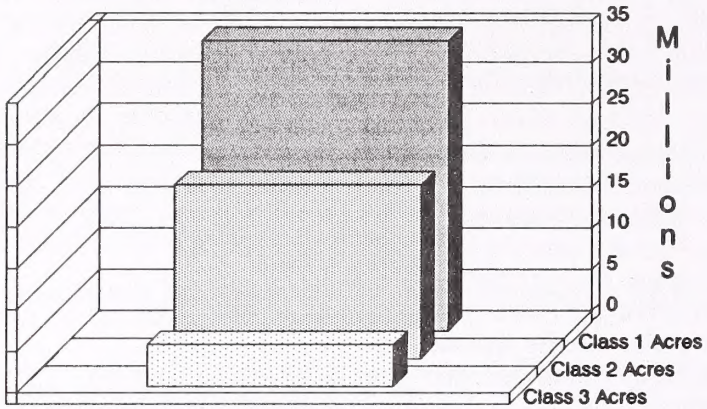
Table IV-17
Watershed Condition Classes by Alternative
(Number of Watersheds)

Alternative		Class	Decade 1			Decade 5		
			1	2	3	1	2	3
PRF	(Preferred Alternative)		26	34	1	42	19	0
RPA	(1990 RPA Program Emphasis)		23	35	3	31	29	1
CUR	(No Action / No Change)		26	33	2	41	20	0
CBF	(Citizens for Better Forestry)		30	30	1	50	11	0

Figure IV-4
Watershed Condition Class by Alternative

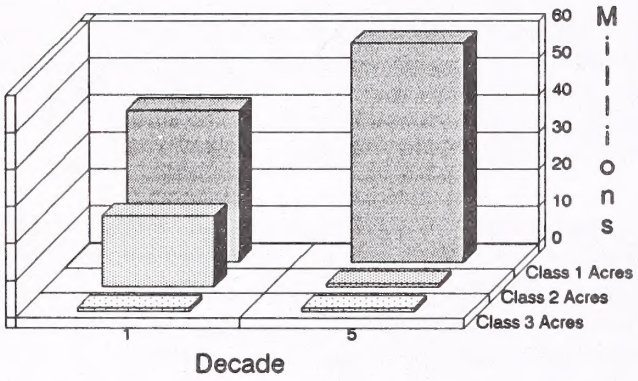
Present Situation

1993



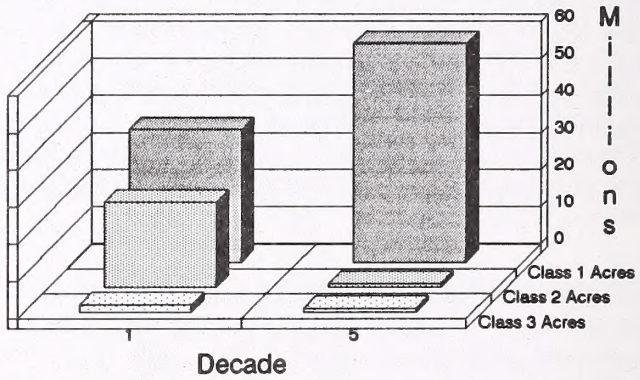
Alternative

PRF



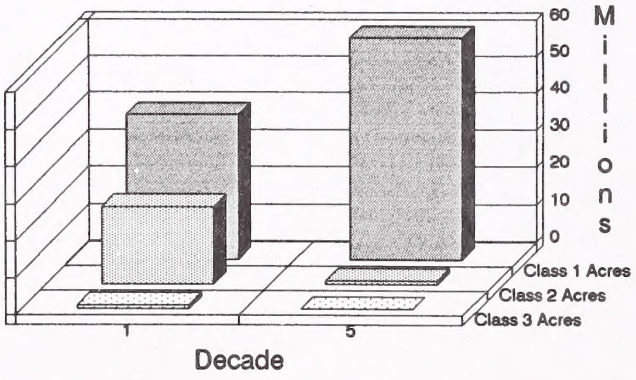
Alternative

RPA



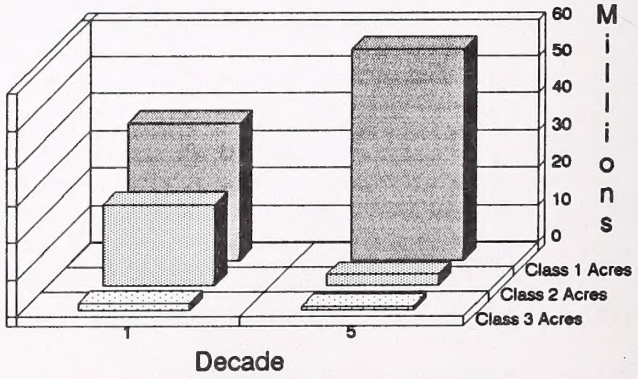
Alternative

CUR



Alternative

CBF



decline to watershed condition class 3 have a greater potential for degradation. However, because the extent and intensity of ground disturbance is decreasing greatly compared to historic levels, watersheds are recovering in each alternative analyzed. Implementation of any of the alternatives would result in an improvement in watershed condition, beginning in the 1st decade.

Cumulative Watershed Effects. Over the short term, all watersheds on the Forests, except for the Rattlesnake Creek watershed, are projected to be well under the threshold of concern (TOC). Special management emphasis on cumulative watershed effects would be given to this watershed in addition to other watersheds which were degraded by the 1987 fires. Due to this management emphasis, in conjunction with watershed improvement projects which are ongoing, there should be no irreversible impacts. No significant adverse impacts would occur.

To insure watershed condition and protection against water quality degradation from cumulative effects, BMPs would be implemented. A standardized cumulative effects analysis methodology would also be applied to subwatersheds at the project level. This would aid in preventing subwatersheds from exceeding their individual TOC.

If impacts remain below threshold in these subwatersheds, they would also remain below threshold in the larger fifth-order watershed, and the consequences of cumulative effects would be avoided.

Direct effects, such as the degradation of stream channels, fish habitat, riparian vegetation, reduced reservoir life, damage to hydroelectric facilities, and the destruction of stream crossings and facilities adjacent to or within flood plains, should be minimal. Additionally, indirect effects to recreation opportunities, fisheries, beneficial uses and upslope instability should also be minimal.

Another aspect of watershed condition is the potential for cumulative watershed effects resulting from uncoordinated land management activities on public and private lands. Because of the potential problems which could result, Forest personnel have adopted a "fair share" policy. In effect, this means that the Forests would constrain management levels on National Forest lands to equivalent roaded acre (ERA) levels which would be proportional to the percentage of National Forest land in a watershed.

There are 14 watersheds within the Shasta-Trinity National Forests which contain between 35 to 68 percent privately owned lands. Without cooperative planning there is a risk that uncoordinated management activities could contribute to cumulative watershed effects. Some subwatersheds could be impacted from combined management activities on both private and National Forest lands. This would be especially true for the larger contiguous land holdings as well as in the "checkerboard" ownership areas.

Therefore, the "fair share" policy may not always be possible to apply since it might lead to adverse effects. Because of this, management opportunities on National Forest lands may be limited for a period of time to allow for watershed recovery. A second option would be the implementation of special mitigation measures, such as road surface stabilization or wider riparian management zones to help minimize the risk of additional cumulative impacts. Ideally, through mutual application of BMPs and cooperative planning and scheduling, National Forest managers can work with private landowners to protect these watersheds from undergoing cumulative impacts.

Water Yield

Consequences Common to all Alternatives

Water yield increases are directly related to the extent and amount of vegetation treatment. In this regard, water yield increases in each alternative would be induced ("spin off") outputs resulting principally from timber harvesting activities in each alternative. As the volume of timber harvested (or land base altered) increases, water yields would increase; and as the harvested land base decreases, water yields decrease.

Harvest acres and volumes are displayed and discussed in the Timber section of this chapter. The indicator used here to describe the effects of each alternative on water yield is the expected average annual yield in thousands of acre-feet averaged over a 50 year period. These yields are displayed in **Table IV-18.**

Table IV-18
Average Annual Water Yield by Alternative
(50 year average in thousand acre feet)

Alternative	Water Yield
PRF	5,438
RPA	5,462
CUR	5,458
CBF	5,437

Consequences Specific to an Alternative

Alternative PRF (Preferred Alternative). This alternative would produce, on the average, 19,000 acre-feet of water less per year than Alternative CUR. This would be a decrease of about 0.4 percent.

Alternative RPA (1990 RPA Program Emphasis). In this alternative the average annual water yield would increase 5,000 acre-feet compared to Alternative CUR. This would be an increase of about 0.09 percent.

Alternative CUR (No Action/No Change). Alternative CUR would produce the average yield of water that is currently being produced from National Forest land (5,455 M acre feet). Consequently, water available for use on the Shasta-Trinity National Forests and downstream would remain the same, fluctuating from year to year depending on the annual changes in precipitation.

Alternative CBF (Citizens for Better Forestry). The average annual water yield for this alternative would be 19,000 acre-feet less than Alternative CUR. This would be a decrease of about 0.4 percent.

22. WILD AND SCENIC RIVERS

Consequences Common to all Alternatives

The existing Wild and Scenic Rivers System, consisting of about 106.4 miles of the Trinity River system, remains the same under all alternatives. Because these designations already exist, there are no environmental consequences associated with the existing Wild and Rivers System.

In managing the three classifications of rivers (Wild, Scenic, and Recreation), three distinct management prescriptions are proposed within the one-quarter mile corridors. For wild river segments Prescription I (Unroaded Non-Motorized Recreation) is applied (except in wilderness); for scenic river segments Prescription II (Limited Roaded Motorized Recreation) is applied; and for recreation river segments Prescription III (Roaded Recreation) is applied. Restrictions on management activities and uses are most severe along wild river segments and least severe along recreation segments.

The above prescriptions would also apply to additional river segments being proposed for designation in each of the alternatives. Therefore, the major differences between alternatives are the number of miles of wild, scenic, and recreation rivers that are proposed for designation.

Generally speaking, the larger the number of miles, the greater the adverse effect would be on potential water diversion for energy and agriculture and potential mineral development opportunities. On the other hand, the greater the number of miles, the greater the positive effect on the watershed, riparian areas, fisheries, and water quality. Refer to Appendix E for detailed discussions of wild and scenic rivers.

Consequences Specific to an Alternative

Table IV-19 indicates the recommended wild and scenic rivers' classifications on National Forest streams for each of the alternatives.

Alternative PRF (Preferred Alternative). Under this alternative the existing 106.4 miles of wild and scenic rivers would be supplemented by about 62.2 miles of National Forest streams being proposed for Congressional designation.

Of the 62.2 miles of National Forest land involved, 42.0 miles are recommended for Wild River, 17.3 miles for Scenic River and 2.9 miles for Recreation River.

The McCloud River and Squaw Valley Creek are not recommended for wild and scenic river classification. However, the characteristics which made the McCloud River eligible for classification would be retained through a Coordinated Resource Management Plan with the private landowners along the river. (See Appendix N in the proposed Forest Plan).

Within the one-quarter-mile corridor along the 42.0 miles of Wild River the environmental consequences would be as follows:

--No impoundments or diversions would be allowed;

--No mineral entry would be allowed; other than existing valid rights;

--No scheduled timber harvesting would occur;

--Access would be limited to trails; no road access would be allowed;

--River corridors, including riparian areas, would be semi-primitive in nature.

Within the one-quarter-mile corridor along the 17.3 miles of Scenic River the consequences would be:

--No impoundments or diversions would be allowed;

--Mineral exploration and extraction would be allowed consistent with the law;

--Only minimal timber harvesting, primarily salvage, could occur on suitable timber lands;

--Road access would be limited;

Within the one-quarter-mile corridor along the 2.9 miles of Recreation River segments restrictions would be less, resulting in relatively few consequences. Impoundments would still not be permitted. Modified timber harvesting would be allowed on suitable timber lands and road access could occur in more places.

Overall, there would be relatively minor effects on timber harvests and allowable sale quantities within the river corridors. Most of the proposed river corridors are on lands classified as unsuitable for timber management or on lands which would be assigned prescriptions where no chargeable volumes are scheduled (e.g., Prescription IX - Riparian Management). Dispersed recreation would be affected because of limited access.

Alternatives RPA (1990 RPA Program Emphasis), and CUR (No Action/No Change). These alternatives do not propose any additions to the existing 106.4 miles of Wild and Scenic Rivers System. Not having the additional river corridors would, however, eliminate the additional protection to the watershed and fisheries.

Alternative CBF (Citizens for Better Forestry). This alternative recommends the same additions to the Wild and Scenic Rivers System as Alternative PRF. In addition, Alternative CBF recommends Canyon Creek, Upper and

Table IV-19
Recommended Wild and Scenic Rivers
(National Forest Miles)

NAME	ALTERNATIVE PRF	RPA	CUR	CBF
Beegum Creek				
Wild River	2.5	-	-	2.5
Canyon Creek				
Wild River	-	-	-	6.5
Recreation River	-	-	-	11.0
Hayfork Creek				
Wild River	-	-	-	10.0
Scenic River	11.5	-	-	1.0
Recreation River	-	-	-	.50
	Total 11.5			**Total 11.5**
McCloud River (Lower)				
Wild River	-	-	-	4.3
Scenic River	-	-	-	1.8
McCloud River (Upper)				
Recreation River	-	-	-	14.7
Scenic River	-	-	-	-
North Fork Trinity River				
Wild River	11.7	-	-	11.7
South Fork Trinity River				
Wild River	16.1	-	-	16.1
Scenic River	5.8	-	-	5.8
Recreation River	2.9	-	-	2.9
Sacramento River				
Recreation River	-	-	-	6.1
Squaw Valley Creek				
Wild River	-	-	-	4.0
Scenic River	-	-	-	6.0
Virgin Creek				
Wild River	11.7	-	-	11.7
Total - Wild	42.0	-	-	56.8
Total - Scenic	17.3	-	-	25.1
Total - Recreation	2.9	-	-	34.7
Total Miles	**62.2**	-	-	**116.6**

* An extension of BLM designation north of the forest boundaries, which is segment #2 of the main fork.

Lower McCloud River, Sacramento River, and Squaw Valley Creek. These sections of river contain an additional 54.4 miles of proposed rivers.

Of the 116.6 miles of National Forest land involved, 56.8 miles are recommended for Wild River, 25.1 miles for Scenic River, and 34.7 miles for Recreation River. The consequences on those recommended segments would be the same as described for Alternative PRF.

23. WILDERNESS AND ROADLESS AREAS

This assessment encompasses the probable environmental consequences on wilderness and roadless areas resulting from adoption of any one of the four alternatives described in detail in this Draft EIS.

The analysis focuses on the primitive recreation opportunities that would be retained or foregone regardless of whether these areas would be recommended for additions to the National Wilderness Preservation System.

Consequences Common to all Alternatives

There are five Wildernesses on the Shasta-Trinity National Forests totaling 498,776 acres. There is one further planning area, Mt. Eddy, which totals 7,720 acres. At issue is whether the Mt. Eddy area should be recommended for wilderness designation. Wilderness designation of Mt. Eddy would preclude some management activities such as timber harvesting and downhill ski development. Conversely, development of Mt. Eddy may permanently impair potential wilderness values.

Wilderness attributes used in this analysis to determine the quality of a specific undeveloped area are identical to the elements used in the previous Roadless Area Review and Evaluation (RARE II) study. The definition of the Wilderness Attributes Rating System can be found in the glossary.

This section focuses on the general nature or type of impact of management practices and activities on wilderness attributes. Viewed in this generic context, management practices and activities do not vary from one alternative to another. However, it is obvious that there are identifiable differences between alternatives. The major variations between alternatives are due to the mix of management prescriptions under each alternative.

Table IV-20 summarizes the effect of management prescriptions on each of the above wilderness attributes. The table indicates the degree to which the attribute is retained from its current inventoried condition. Both short-term (10 years) and long-term (50 years) effects are considered.

The table indicates that Prescriptions I (Unroaded Non-Motorized Recreation), II (Limited Roaded Motorized Recreation), V (Wilderness Management), VII (Threatened, Endangered, and Selected Sensitive Species), and X (Special Area Management) would generally retain and slightly enhance inventoried intrinsic wilderness attributes. Prescriptions III (Roaded Recreation), IV (Roaded, High Density Recreation), VI (Wildlife Habitat Management), VIII (Timber Management) and IX (Riparian Management) would cause severe inroads on these attributes. By comparing **Table IV-20** descriptions of the effects of each prescription on wilderness attributes with the maps of each alternative the effects of each alternative within and adjacent to the area can be assessed.

The Mt. Eddy area, the only further planning area to be analyzed for wilderness consideration under this round of Forest planning, is assigned to several prescriptions depending on the alternative themes and objectives. (See **Table C-1** in Appendix C). Therefore, the overall quality of this area for wilderness is the product of the combined effects of each of the prescriptions used within that area.

For example, if only 10 percent of the Mt. Eddy area were distributed to development-oriented prescriptions (e.g., Prescriptions III [Roaded Recreation], VI [Wildlife Habitat Management], and/or VIII [Timber Management]) and 90 percent were distributed to a non-development prescription, the overall wilderness attributes for the entire Mt. Eddy area would not be substantially impaired. Also, if the 10 percent that was distributed to development-oriented prescriptions were separated from the Mt. Eddy area boundary, the remaining 90 percent would be totally unimpaired.

The important consideration is the amount of area allocated by prescription and the location and distribution of those prescriptions. Since this varies by alternative, the impacts on wilderness attributes are discussed in the sections which follow.

Under the 1984 California Wilderness Act, all areas not designated by Congress for Wilderness or further planning were "released" for multiple-use resource management, exclusive of wilderness use. Twenty-nine areas on the Shasta-Trinity National Forests, totalling about 306,000 acres (net) fell under this category. These areas would be subject to review for possible wilderness classification when the proposed Forest Plan is revised in 10 to 15 years. Therefore, the amount of primitive recreation opportunities that are retained or foregone in the meantime is an important consideration.

Figure IV-5 summarizes the future disposition of the 29 "released" roadless and undeveloped areas on the Shasta-Trinity. The figure indicates that the amount of land subject to development (i.e., activities which would impact the primitive recreation characteristics of these areas) varies from 29 percent of the approximately 306,000 acres under Alternative RPA to 12 percent under Alternative CBF. Further analysis of the released areas also appears in Appendix C.

Consequences Specific to an Alternative

Alternative PRF (Preferred Alternative). Wilderness attributes would be retained on about 90 percent of the

Mt. Eddy area through allocations to Semi-Primitive Recreation and Research Natural Area (Prescription X). About 81 percent of the 29 released roadless area's acreage would remain undeveloped.

Alternative RPA (1990 RPA Program Emphasis). This alternative would eventually diminish most of the inventoried wilderness attributes in the Mt. Eddy area. This is due to emphasis on resource management activities which require roaded access and vegetation modification, and would result in higher densities of people. About 71 percent of the 29 released roadless area's acreage would remain undeveloped.

Alternative CUR (No Action/No Change). Wilderness attributes would be retained on about 70 percent of the Mt. Eddy area through allocations to Limited Roaded Motorized Recreation (Prescription II). About 72 percent of the 29 released roadless area's acreage would remain undeveloped.

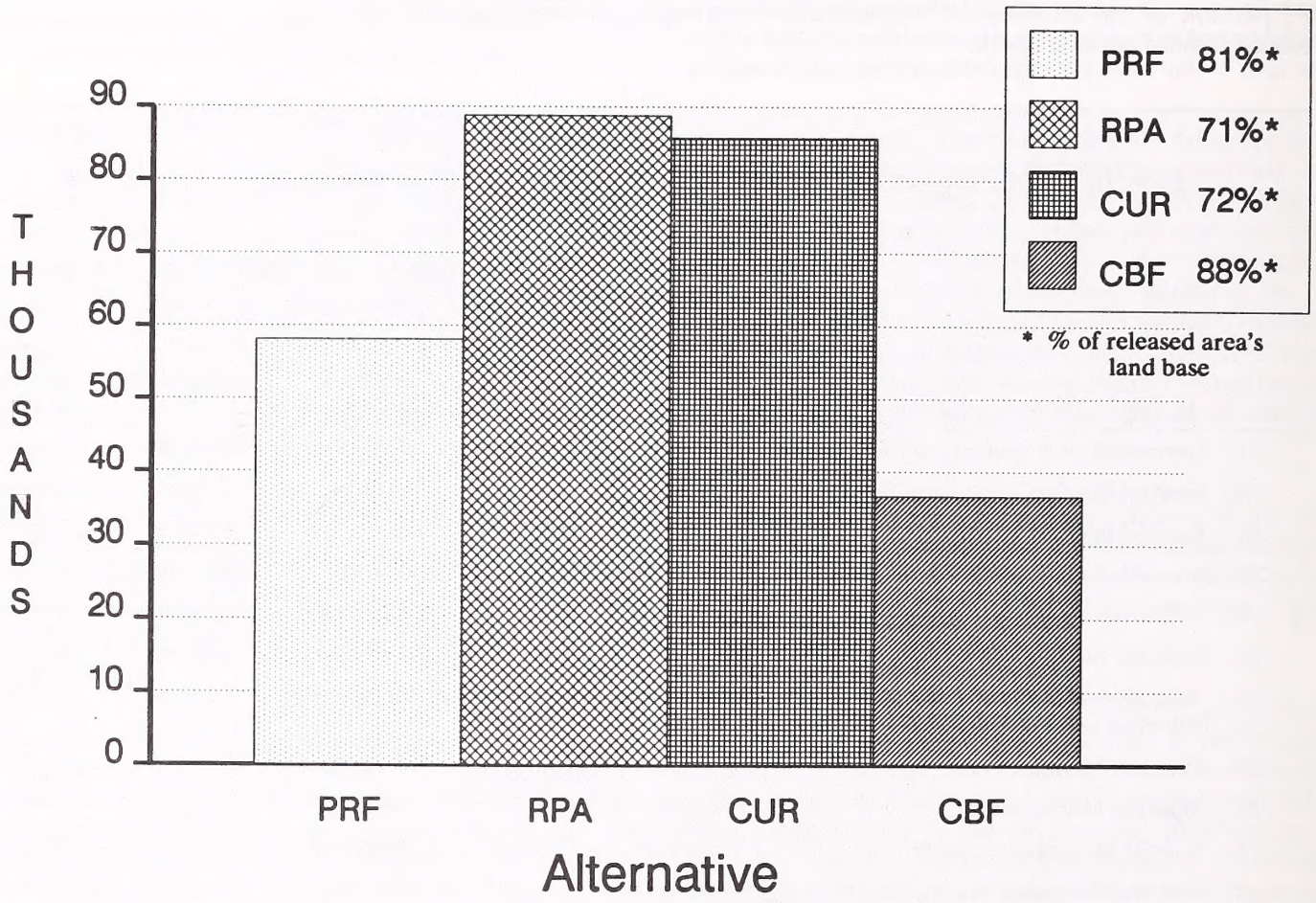
Alternative CBF (Citizens for Better Forestry). This alternative would recommend the entire Mt. Eddy further planning area for wilderness designation. About 88 percent of the 29 released roadless area's acreage would remain undeveloped.

Table IV-20
Effects of Management Prescriptions on Inventoried Wilderness Attributes

		Degree to Which Inventoried Attribute is Retained (Short and Long-term)				
	Management Prescription	Natural Integrity	Apparent Naturalness	Solitude Opportunity	Primitive Recreation Opportunity	Supplementary Attributes
I	Unroaded Non-motorized Recreation	Retained	Retained	Retained	Retained	Retained
II	Limited Roaded Motorized Recreation	Retained	Retained	Reduced	Reduced	Retained
III	Roaded Recreation	Reduced	Reduced	Reduced	Reduced	Reduced
IV	Roaded, High Density Recreation	Eliminated	Eliminated	Eliminated	Eliminated	Reduced
V	Wilderness Management	Retained	Retained	Retained	Retained	Retained
VI	Wildlife Habitat Management	Reduced	Reduced	Reduced	Reduced	Reduced
VII	Threatened, Endangered and Selected Sensitive Species	Retained	Retained	Retained	Retained	Retained
VIII	Timber Management	Eliminated	Eliminated	Eliminated	Eliminated	Eliminated
IX	Riparian Management	Reduced	Reduced	Reduced	Reduced	Reduced
X	Special Area Management	Retained	Retained	Retained	Retained	Retained
XI	Cultural Resource Management	Reduced	Reduced	Reduced	Reduced	Reduced

Figure IV-5
Future Disposition of Released Roadless Areas to be Managed for Non-wilderness Uses Under the 1984 California Wilderness Act (acre [thousands])

Total Acres: 306,060
Net Acres Subject to Development



24. WILDLIFE (General)

Overview of Analysis

Land management activities and natural events can affect wildlife populations by altering the food, water, cover, or spacial components of habitat. Some of these activities and events are beneficial, while others are adverse or neutral depending on species life history requirements and management prescriptions. A project that benefits one species may be adversely affect another. For example, when timber harvest converts late seral stage forests to early seral stage openings, there would be adverse effects to northern spotted owl and golden-crowned kinglet. There would be beneficial effects to the California quail and white-crowned sparrow, but there would be little or no effect to yellow warbler and acorn woodpecker.

The management indicator approach is used, along with proposed Standards and Guidelines, to insure that all species on the Forests would be maintained at viable levels. Management indicators are categorized into wildlife assemblages or groups of wildlife.

Wildlife Assemblages as Management Indicators

1. Late Seral Stage
2. Openings and Early Seral Stage
3. Multi-habitat
4. Snag and Down Log
5. Riparian
6. Aquatic
7. Hardwood
8. Chaparral
9. Cliffs, Caves, Talus and Rock Outcrop

See Chapter III, Wildlife for more wildlife assemblage information.

Wildlife assemblages are influenced by the overall acreage in each management prescription because the objectives and emphasis varies. Management prescription acreage differs by alternative (see **Table IV-21** and management prescription descriptions in Chapter 4 of the proposed Forest Plan). Therefore, alternatives are compared to the historical situation and among each other by analyzing prescription acreage, along with contrasting timber harvest method and quantities.

Consequences Common to all Alternatives

Compared to the historical and existing situation, wildlife habitats would continue to have direct enhancement and rehabilitation activities varying by each alternative's emphasis or quantity of Prescription VI (Wildlife Habitat Management) land. Water, forage, cover, and spatial needs for featured, hunted species would occur (deer, bear, elk, turkey) along with other wildlife such as

Table IV-21
Degree of Habitat Manipulation Resulting from Application of Management Prescriptions by Alternative (M Acres* and % of Land Base)

Management Prescription (and Degree of Habitat Manipulation)	ALTERNATIVE							
	PRF		RPA		CUR		CBF	
IV, VIII (Very High)	553	(26%)	778	(36%)	793	(37%)	601	(28%)
III, VI (Moderate to High)	733	(35%)	628	(30%)	629	(30%)	598	(28%)
II, VII, IX (Minimal)	249	(11%)	172	(08%)	166	(08%)	235	(11%)
I, V, X, XI (Insignificant)	587	(28%)	544	(26%)	533	(25%)	688	(33%)

* M Acres = thousand acres

neotropical migratory birds. A wildlife viewing program would continue to increase people's awareness and appreciation of the Forest and its wildlife resource.

Partnerships and programs for emphasis areas would continue to grow: Elk Country, A Million Bucks, Taking Wing, Answer the Call, Eyes on Wildlife, Partners in Flight, and Animal Inn.

The historical timber harvest level had a much higher effect upon wildlife assemblages compared to the existing situation and the alternatives considered. Timber harvest volume was more than twice the amount than is currently proposed in any of the alternatives. Historically, standards were less protective, resulting in greater habitat manipulation. Adverse impacts occurred for the following assemblages: Late Seral Stage, Snag and Down Log, Riparian, Hardwood, and Aquatic. The larger timber harvest level benefited Multi-habitat, Openings and Early Seral Stage, and Chaparral wildlife assemblages. The number of acres of late seral stage assemblages increases in all alternatives; historically they had been decreasing.

For the alternatives being analyzed, Prescription VIII (Timber Management) would have the highest degree of indirect habitat manipulation. Prescriptions III (Roaded Recreation) and VI (Wildlife Habitat Management) have a lesser degree of indirect habitat manipulation. These prescriptions affect about 25 percent of the Forests' land base. These three prescriptions allow timber harvest and road construction which modify seral stage progression, species composition, and increased access. However, these affects are mitigated by Standards and Guidelines such as seral stage requirements, down log and snag requirements, and the riparian standards. In addition, all land subject to timber harvest activities must comply with the 50-11-40 rule. This rule requires that 50 percent of all 1/4 townships be managed for timber stands with an average of 11 inch diameter trees and 40 percent crown closure. Assemblages that may benefit within these prescription areas are the Openings and Early Seral Stage, Multi-Habitat, and Chaparral. Assemblages that may be adversely effected are the Late Seral Stage, Snag and Down Log, and Hardwoods. Across the Forest, chaparral would remain fairly constant at about 149,300 acres. The amount of hardwoods would remain moderately constant at about 189,600 acres. Seral stages within chaparral and hardwood lands would vary by alternative.

The remainder of the prescriptions (about 75 percent of the land base) has a minimal degree of indirect habitat manipulation which is beneficial to Late Seral Stage, Multi-habitat, Snag and Down Log, Riparian, Aquatic, and Hardwood assemblages. The Cliffs, Caves, Talus and Rock Outcrop assemblage would not be effected by any of the prescriptions or alternatives.

Prescriptions I (Unroaded Non-Motorized Recreation), IV (Roaded, High Density Recreation), V (Wilderness Management), VII (Threatened, Endangered, and Selected Sensitive Species), X (Special Area Management), and XI (Cultural Resource Management) do not allow for timber management activities. Minimal and uneven-aged timber management is not an emphasized practice, but is a permitted practice in Prescription II. Modified timber management is allowed along class 4 streams, while no harvest is allowed along class 3 and higher streams within Prescription IX (Riparian) lands.

For all alternatives, diversity of wildlife habitat would be sufficient to meet population viability for wildlife by implementing and monitoring management requirements and standards and guidelines.

The following short-term consequences of timber management activities could occur on lands under all alternatives:

beneficial effects:

--openings provide forage; edges and patches provide local diversity.

--green tree retention sites provide vertical/structural diversity to early seral stages; trees provide substrate for nests, cover, roosts, and snags and down logs; forage is provided.

adverse effects:

--alteration of forested habitat diversity such as conversion of successional stages, decreased snag and down log size and density, decreased large hardwoods, fragmentation, and loss of interior forest conditions;

--temporary disturbance, decreased thermal protection, displacement of animals and decreased reproductive success.

--mortality of animals during implementation of projects due to crushing, site preparation and burning.

Compared to historical level conditions, the following long-term or cumulative environmental consequences may occur under all alternatives:

beneficial effects:

--late seral stage forests acreage would increase; interior forest areas would increase; thermal cover would increase.

--increased wildlife associated with late seral stage forests and riparian areas; associated or dependent TE&S species populations would stabilize or increase;

--vertical diversity within forest stands would increase.

adverse effects:

--openings and early seral stage forests would decrease; less open forage areas;

--small change as compared to historical levels in the amount of public access and human disturbance as a result of access management;

--small loss when compared with historical levels of habitat associated with surface area occupied by permanent roads and facilities;

--a decrease in wildlife dependent on early successional vegetation

Consequences Specific to an Alternative

Environmental impacts, as well as opportunities to improve wildlife habitats, would vary by alternative. These differences were assessed in the following ways:

--Effects of management prescriptions (specifically timber management prescriptions) on wildlife habitats;

--Effects of alternatives on habitats for wildlife assemblages; differences are primarily a function of the number of acres in each prescription or timber harvest goals by alternative;

--Amount of direct wildlife habitat enhancement and restoration.

Late Seral Stage Wildlife Assemblage

The amount of late seral forests (seral stage 4b, 4c, and greater) is expected to increase from the historical levels and the current situation in all alternatives by the end of the 5th decade. This is a result of less timber harvested. Minimally disturbed forested areas are beneficial for those species which are dependent on or associated with older, complex forests.

Alternative PRF (Preferred Alternative). This alternative provides a moderate degree of maintenance of habitat for the late seral stage wildlife assemblage. Alternative PRF places the second highest amount of land into Prescriptions I (Unroaded Non-Motorized Recreation), IV (Roaded, High Density Recreation), V (Wilderness Management), VII (Threatened, Endangered, and Selected Sensitive Species), X (Special Area Management), and XI (Cultural Resource Management). These prescriptions allow 54 percent of the land base to cycle naturally. After 5 decades, 618,000 acres of late seral stage forest would exist. This would give the second largest increase at 73,000 acres more than current levels.

Alternative RPA (1990 RPA Program Emphasis). Alternative RPA provides a moderate degree of maintenance of habitat late seral wildlife species. Species dependent on mature forest areas would receive reduced benefits from this alternative, compared to Alternative CBF and PRF. Alternative RPA places the second lowest amount of land into Prescriptions I, IV, V, VII, X, and XI. These prescriptions would allow 50 percent of the land base to cycle naturally. After 5 decades, 610,000 acres would exist in late seral stage forest. This would be the lowest increase at 65,000 acres more than current levels.

Alternative CUR (No Action/No Change). This alternative provides a moderate degree of maintenance of habitat for these late seral wildlife species. Alternative CUR places the least amount of land into Prescriptions I, IV, V, VII, X, and XI. These prescriptions would allow 50 percent of the land base to cycle naturally. After 5 decades, 614,000 acres of late seral stage forest would exist. This would be the second largest increase at 69,000 acres more than present levels.

Alternative CBF (Citizens for Better Forestry). Alternative CBF provides a moderate degree of maintenance of habitat for wildlife species dependent or associated with late seral stages. Alternative CBF places the highest amount of land into Prescriptions I, IV, V, VII, X, and XI. These prescriptions would allow 61 percent of the land base to cycle naturally. After 5 decades, 621,000 acres of late seral stage forest would exist. This would provide the greatest increase at 76,000 acres more than present levels.

Openings and Early Seral Stage Wildlife Assemblage

There are about 10,600 acres of naturally occurring grasslands and meadows on the Forests. Openings created through timber management activities are transitional, but they greatly contribute habitat to the early seral stage wildlife. Compared to historical levels, there would be less openings created with each alternative. There would be less regeneration harvesting and less acres and harvest volume by all methods.

With the Alternatives, Prescription VIII would have a high degree of habitat manipulation because timber management is emphasized. Modified and uneven-aged timber management is also a permitted practice. Prescriptions III and VI have a moderate degree of habitat manipulation. Prescriptions VIII, III, and VI reduce the existing amount of middle to late seral stage forest stands, hardwoods, and dead-down material. They also increase the potential for wildlife disturbances associated with increased access and fragmentation.

This wildlife assemblage would benefit by the increase in open habitat, such as plantations. Some benefits would be moderated because of increased road density and its

increased disturbance. The amount of early seral habitat is expected to increase from the current situation in all alternatives by the end of the 5th decade.

Alternative PRF places 18 percent of the land base (second lowest) into Prescription VIII. PRF would have a very low amount of acreage scheduled for the clearcut timber harvest method. After 5 decades, 177,000 acres of seral stages 1 and 2 would be present. This is the second lowest at 71,000 acres more than current levels.

Alternative RPA places 26 percent of the land base (second highest) into Prescription VIII. RPA would schedule the highest acreage of clearcut timber harvest methods. After 5 decades, 185,000 acres of seral stages 1 and 2 would be present, which is the most at 79,000 acres more than current levels. This alternative would be the most beneficial to wildlife of the early seral stage assemblage.

Alternative CUR places 26 percent of the land base (highest amount) into Prescription VIII. CUR would schedule the second highest acreage to clearcut harvest methods. After 5 decades, 181,000 acres of seral stages 1 and 2 would be present. This is the second highest at 75,000 acres more than current levels.

Alternative CBF places 17 percent of the land base (lowest) into Prescription VIII. CBF would have no clearcut timber harvest. After 5 decades, 163,000 acres of seral stages 1 and 2 would be present. This is the lowest at 57,000 acres more than current levels. This alternative is likely to be the least beneficial to wildlife of the early seral stage assemblage.

Multi-Habitat Wildlife Assemblage

Both open habitats (e.g., Chaparral or Openings and Early Seral Stage) and cover habitats (e.g. Hardwood or Late Seral Stage) are important for bear, elk, turkey and deer. Therefore, these species benefit from landscape diversity and mosaic patchwork of openings and cover. Acreage of chaparral would remain fairly constant at about 149,300 acres. Acreage of hardwoods would remain moderately constant at about 189,600 acres. Seral stages would vary for chaparral and hardwoods would vary by Alternative and direct habitat manipulation.

Alternative PRF, after 5 decades, would provide for the second lowest amount of created openings and the second highest amount of late seral stage forests.

Alternative RPA, after 5 decades, would provide for the highest amount of created openings and the lowest amount of late seral stage forests. RPA would have a higher intensity of direct open habitat manipulation to maintain or increase deer populations.

Alternative CUR, after 5 decades, would provide for the second highest amount of created openings and the second lowest amount of late seral stage forests.

Alternative CBF, after 5 decades, would provide for the least amount of created openings and the highest amount of late seral stage forests.

Snag and Down Log Wildlife Assemblage

Compared to historic levels, all Alternatives would retain a higher density of dead-down material for these wildlife species. Timber management would be much less than historical levels, thus more acres would retain natural levels of snag and log densities. For each Alternative, standards and guidelines for retaining snags and down logs would remain constant. There could be varying densities between alternatives because timber management treatments (such as regeneration cutting) and acreage would vary; however, compliance with standards and guidelines should provide for acceptable levels of snags and log densities. Green tree retention treatments would moderate adverse impacts to this wildlife group because the large green trees would become future snags and down logs.

Under Alternative PRF 4,400 acres would be scheduled for regeneration harvest as compared to historic levels. This alternative would have the lowest amount of timber harvest acreage. Alternative PRF, therefore, would be most beneficial to wildlife requiring snags and down logs.

Alternative RPA would have the highest amount of acreage scheduled for the regeneration harvest method, but it would still be below historic levels. This alternative would have the second highest amount of timber harvest acreage. Alternatives RPA and CUR would be the least beneficial to the Snag and Down Log Wildlife Assemblage.

Alternative CUR would schedule the second highest acreage to regeneration harvesting, but it would still be below historic levels. Alternative CUR would have the highest acreage predicted for stand maintenance (salvage) treatment. This alternative would have the highest amount of timber harvest acreage. Alternatives RPA and CUR would be the least beneficial to this assemblage.

Alternative CBF would also have a relatively low amount of regeneration harvesting when compared to historic levels. Alternative CBF would have the second lowest amount of timber harvest acreage. This alternative would be the second most beneficial to this assemblage.

The **Hardwood Wildlife Assemblage** would be less adversely impacted compared to the historical situation, because timber harvest acres and volume would be much less. In all alternatives approximately 75 percent

of the Forests would not be subject to any harvest that would adversely affect hardwoods. The proposed standards and guidelines for the hardwood community would be the same for all alternatives. Where hardwoods are intermixed with conifers, proposed standards and guidelines vary by Prescription. Prescription VIII reserves a minimum of 5 square feet of hardwood basal area per acre in suitable timber lands. In Prescriptions III and VI, an average of 30 square feet of hardwood basal area per acre is reserved. Alternatives with higher acreages of Prescription VIII would have more adverse impacts to wildlife that require hardwood for habitat needs. This would apply only on those acres available for timber harvest.

Alternative PRF would have the second least acres assigned to Prescription VIII. It would also have the second least adverse impact on wildlife requiring hardwoods.

Alternative RPA would have the second most acres assigned to Prescription VIII. It would also have the second most adverse impact on wildlife requiring hardwoods.

Alternative CUR would have the most acres assigned to Prescription VIII. It would have the most adverse impact on wildlife requiring hardwoods.

Alternative CBF would have the least acres assigned to Prescription VIII. It would have the least adverse impact on wildlife requiring hardwoods.

The **Chaparral Wildlife Assemblage** would benefit from timber harvest activities that would create a mosaic of age classes and plant species. Wildlife associated with the chaparral community would also benefit from direct habitat enhancement that would create a mosaic of age classes and plant species. The standard and guidelines for the chaparral community would be the same for any alternative. But timber management regimes vary by alternative. This would create more open, transitory shrub-like areas (e.g. plantations). Therefore, alternatives that have more acres assigned to Prescription VIII and regeneration timber harvest methods, would benefit chaparral wildlife because of more openings being created.

Alternative PRF would place 18 percent of the land base (second lowest) into Prescription VIII. PRF would have a very low amount of acreage scheduled for the clearcut timber harvest method. Alternative PRF would be second least beneficial to chaparral wildlife, because it would create a small amount of openings and some direct chaparral treatments would occur.

Alternative RPA would place 26 percent of the land base (second highest) into Prescription VIII. This alternative would schedule the high acreage of clearcut timber harvest methods. Alternative RPA would have a higher intensity of direct open habitat manipulation (e.g. prescribed fire in chaparral to maintain or increase deer populations. Alternative RPA would be the most beneficial for chaparral wildlife because of the combined effect of direct and indirect management.

Alternative CUR would place 26 percent of the land base (highest amount) into Prescription VIII. Alternative CUR would have the most acreage scheduled for timber harvest, but the second most acres scheduled for the clearcut harvest method. There would be minor direct habitat treatment.

Alternative CBF would place 17 percent of the land base (lowest) into Prescription VIII. Alternative CBF would have no clearcut timber harvest. This alternative would be the least beneficial to chaparral wildlife, because it would create the lowest amount of openings. Some direct chaparral treatments would occur.

Riparian and Aquatic Wildlife Assemblages would have better conditions compared to the historical situation because of protective standards and guidelines, Best Management Practices, land allocations, and supplemental Management Area direction. Aquatic wildlife would be cared for through application of fish management standards and guidelines. Riparian Management Zones (RMZs) are the same for all alternatives. No timber harvest would be allowed along Class 1 and 2 RMZs and limited harvest activity would be allowed along Class 3 and 4 RMZs (see Management Prescription IX). Riparian and aquatic wildlife would not be adversely affected in perennial stream RMZs (class 1 and 2 streams). RMZs are smaller at lakes, wetlands, springs, ephemeral streams and intermittent streams. Habitat components, such as future down logs and microclimate, could be modified, but only if riparian values would be protected. Thus, wildlife requiring these areas would be provided for.

The riparian standards and guidelines adequately provide for riparian values at the same level in all alternatives.

WILDLIFE (Threatened, Endangered, and Sensitive Species)

Consequences Common to all Alternatives

All known or future sites of Federally listed threatened or endangered (T&E) species would be fully protected by the Shasta-Trinity National Forests and managed according to Prescription VII. All alternatives would meet the intent of the respective recovery plans for these species.

Threatened: At present, there are two known Federally listed threatened wildlife species on the Forests: northern spotted owl and marbled murrelet.

Endangered: At present, there are two known Federally listed endangered wildlife species on the Forests: bald eagle and peregrine falcon.

Sensitive: All known or future sites necessary to provide for viable populations of sensitive wildlife species would be fully managed and/or protected as necessary. Overall, the amount of Prescription VII habitat would fluctuate by not more than five percent between all the alternatives.

Threatened

Spotted Owls. All alternatives would be managed according to the Final Northern Spotted Owl EIS, Interagency Scientific Committee (ISC) Report and the Draft Fish and Wildlife Service Recovery Plan.

Marbled Murrelet. There are no known occurrences or nesting of this species on the Forests.

Endangered

Bald Eagle. All alternatives would exceed the recovery target of 20 pairs of bald eagles. Habitat exists for continued expansion of this species on the Forests.

Peregrine Falcon. All alternatives would exceed the recovery target of 6 pairs of peregrine falcons. Habitat exists for the continued expansion of this species on the Forests.

Consequences Specific to an Alternative

There is a difference between alternatives for furbearers. Alternative CBF would have more lands in Prescription VII for fisher and marten when compared to the other alternatives. Alternative PRF would provide the second most acreage for fisher and marten.

Sensitive

Fisher and Pine Marten. Prescriptions that allow no scheduled timber harvest and streamside corridors would provide sufficient mature and older over-mature habitats of appropriate size and pattern to maintain viability of fisher and pine marten in all alternatives.

Goshawk. All alternatives would provide a minimum of 150 habitat areas for goshawks in a matrix system of 18 square mile blocks per pair of goshawks. Each alternative would provide for at least 150 acres of suitable habitat within each territory at any one point in time. The above criteria would maintain the viability of goshawks in all alternatives.

Willow Flycatcher. Application of the special riparian management zone standards would provide for maintaining viability in all alternatives.

E Means to Mitigate Adverse Impacts

Forest Standards and Guidelines were developed by the interdisciplinary team to provide guidance and direction to the land manager and to provide a system by which adverse impacts can be mitigated. Specific direction is included in these standards and guidelines to assure that long-term productivity is not impaired by the application of short-term management practices.

As noted earlier, standards and guidelines, along with laws, regulations, policies, and Pacific Southwest Region Minimum Management Requirements and Minimum Implementation Requirements apply to all alternatives.

The list of standards and guidelines which serve as mitigation measures is lengthy. A summary of the management direction for the Shasta-Trinity National Forests is described in Chapter II. A description of Forest Standards and Guidelines is contained in Chapter 4 of the proposed Forest Plan.

F Adverse Environmental Effects Which Cannot Be Avoided

Implementation of the proposed action or any of the alternatives would result in some adverse environmental effects that cannot be avoided. The application of the standards and guidelines is intended to limit the extent and duration of these effects.

However, some adverse effects that cannot be avoided are included in the proposed action and alternatives to it. These effects include:

--Short term increases in erosion and sedimentation resulting from soil disturbing vegetative management activities would occur despite application of erosion and water quality control measures and avoidance of highly erosive and/or unstable land areas. In all alternatives road construction would result in increased erosion and permanent loss of productive land.

--Short-term adverse effects would take place on scenic quality because of vegetation management and road construction.

--Timber volumes would be foregone because of the inaccessibility and inoperability of steep landforms and by prescribing management prescriptions that do not allow harvesting.

--Short-term reduction in air quality would occur because of dust, smoke, and automobile emissions resulting from increased recreation use and vegetative management practices.

Mitigation measures are included in the standards and guidelines and in the management prescriptions in the proposed Forest Plan. They are intended to mitigate the adverse effects that cannot be avoided.

G Relationship Between Short-Term Uses and Long-Term Productivity

The National Environmental Policy Act of 1969 (NEPA) requires consideration of short-term uses and long-term productivity in environmental analyses, but it does not define the terms. The relationship between the two is very complex. Forest management of public lands is a long-term venture, but one that must serve the year-to-year needs of society. The thrust of consideration appears to be toward maintenance of productivity over the very long term. Short-term uses might be considered as annual activities such as recreation, timber harvest or grazing, but these occur on a continuing basis and are probably acceptable so long as productivity is not significantly impaired.

The inherent ability for long-term productivity is lost if soil productivity and hydrologic characteristics are impaired permanently by short-term uses. Such things as compaction, soil erosion, and nutrient losses can result in a gradual decrease in timber and range productivity thus adversely affecting sustained yields for future generations.

The Multiple-Use Act defines sustained yield as the "achievement and maintenance in perpetuity of high annual or periodic output of the various renewable resources of the National Forests without impairment of the productivity of the land."

While short-term uses can adversely affect long-term productivity, they can also enhance long-term productivity as in the case of a managed forest. Short-term activities such as timber harvest, when applied properly, can increase growth and, therefore, increase long-term productivity over that of an unmanaged forest condition. In fact, an unmanaged forest will, over time, decline in growth and, therefore, lower long-term productivity.

Much of the specific direction and mitigation requirements of management standards and guidelines is directed toward maintaining long-term productivity. The interdisciplinary team developed management standards and guidelines for two basic purposes: first, to ensure or protect long-term productivity; and, secondly, and equally important, to assure coordination and/or mitigation between resource uses and activities. The intent, ultimately, is that long-term productivity and values of all resources be maintained at acceptable levels. These standards and guidelines have the potential to maintain long-term productivity.

The National Forest Management Act of 1976 (NFMA) Planning Regulations require that the Forest Plan specify

monitoring and evaluation requirements. The purpose is twofold. On the one hand, monitoring is to assure that the goals and objectives of the Forest Plan are, in fact, being met. On the other hand, monitoring is instituted in order to determine that long-term productivity is maintained. Monitoring requirements are displayed in the accompanying proposed Forest Plan. The requirements would be similar for all alternatives. More intensive and costly monitoring activities and frequencies would be expected under high production Alternatives CUR (No Action/No Change), and RPA (1990 RPA Program Emphasis). Slight relaxations would be anticipated under Alternatives PRF (Preferred Alternative) and CBF (Citizens for Better Forestry).

In summary, through policy implementation, improvement of practices, and monitoring it is expected that long-term productivity of the Forests can be maintained while still receiving the benefits of short-term uses.

H Irreversible or Irretrievable Commitment of Resources

Irreversible commitment of resources refers to resources that are renewable only over a long period of time, such as soil productivity, or to nonrenewable resources, such as cultural resources or minerals. Alternatives were formulated with the understanding that maintenance of future options was an important consideration. Measures to protect those resources that could be irreversibly affected by other resource uses were incorporated in the Forest standards and guidelines.

The construction of arterial and collector roads to provide future access to the Forests is considered an irreversible action because of the time needed for a road to revert back to natural conditions. Also, the extraction of gravel and rock used for road construction and reconstruction is an irreversible action. Mining and dam construction are also examples of activities that represent irreversible commitment of resources. Alternatives RPA and CUR, with the highest resource output levels, have the greatest irreversible commitment of resources based on associated construction of roads. Alternatives PRF and CBF have the fewest irreversible actions and protect future options the most. All alternatives are at levels below historical averages, however.

Site-specific environmental analyses would further explore the impacts of any dam construction proposed on the National Forests relative to the irreversible commitment of resources. This Draft EIS and the proposed Forest Plan do not include decisions on major dam construction projects (e.g. proposed enlargement of Shasta Dam, etc.). They lie outside the scope of forest planning.

Irretrievable commitment of resources is the production or use of renewable resources that are lost because of allocation decisions made. This represents opportunities foregone for the period of time that the resource cannot be used. Timber on steep slopes, that is not economically accessible, may represent an irretrievable commitment of resources since mortality is not salvageable. The commitment is irretrievable rather than irreversible because future technological advances could make harvest of these areas possible and feasible. Another example of irretrievable commitment of resources is wilderness designation.

The difference between alternative-output levels and the higher levels that could be produced also represents an irretrievable commitment of resources. For example, a low level of forage use for domestic livestock grazing or a low level of water yield could be increased in the future based on the application of different management prescriptions, but the outputs between now and then would be "lost" or not available for use. Therefore, the maintenance of future options and the current utilization of the resources to the fullest extent possible tend to conflict with one another. The purpose of Forest planning is to provide a mix of uses now and for future time periods that balance the needs of both the current population and future generations.

I Possible Conflicts with Federal, Regional, State, and Local Land-Use Plans

There are no known conflicts with plans of cooperating or affected agencies. Early in the Forests' planning process (1980), interested and affected Federal, State, and local agencies and jurisdictions enumerated their concerns relative to the management of the Shasta-Trinity National Forests. Information provided by the various agencies helped the interdisciplinary team establish the issues to be addressed in the proposed Forest Plan and the Draft EIS. Coordination with these agencies has continued throughout this planning process and is expected to continue into the future. This Draft EIS and the proposed Forest Plan provide a vehicle to resolve any problems with other public agencies should a conflict result from any of the direction contained in the various alternatives including the proposed Forest Plan.

To avoid future conflicts, close coordination and cooperation will need to continue between affected agencies in implementing the selected alternative. These agencies include:

U.S. Department of Interior-Bureau of Land Management (BLM). The areas within which continued cooperation is expected are: development of joint chaparral management plans, off-highway vehicle management, range administration, cadastral survey programs, and minerals management. Active coordination in the above programs will mitigate any future conflicts between the two agencies.

U.S. Fish and Wildlife Service (USFWS). The Shasta-Trinity National Forests will continue to coordinate their efforts in the management of the bald eagle, peregrine falcons, northern spotted owl, marbled murrelet, and other T&E territories through the USFWS consultation process. Coordination will continue with the California Department of Fish and Game (DFG), and Recovery Plans.

California Department of Fish and Game (DFG). Because of the divergent missions of the National Forests and the DFG, there will always be some difference of opinion on how certain areas of land should be managed. The planning objectives of the DFG provide a good perspective and position on the resolution of land use conflicts involving fish and wildlife management. Close coordination of planning efforts in the development and implementation of the various State game herd and special fishery plans and the implementation of the eventual alternative selected in this Draft EIS will need to continue. This effort, along with a coordinated monitoring action plan, will mitigate differences that arise between the agencies.

State Water Agencies. Water quality standards will continue to be met using Best Management Practices (BMPs). Critical watersheds will be maintained as part of project management implementation. These measures will minimize future conflicts in watershed management between the Shasta-Trinity National Forests and State water agencies.

California State Parks. Some potential visual resource conflicts, due to timber management activities, are possible with the California State Parks agency in the area surrounding Castle Crags State Park. It is evident that the viewshed from Castle Crags is sensitive enough that these values should be considered in the design of area projects.

State Energy Agencies. Possible conflicts may arise from both direct impacts on the land and indirect impacts because of regional energy needs.

As the growing population of California scrambles for relatively cheaper sources of dependable energy from inside and outside the State, there will be an ever-increasing need to develop new facilities and upgrade existing power inter-ties. This emphasis will result in new needs for power transmission corridors across the Forests. Again, the State Energy Commission is at the forefront of this renewed emphasis.

County Governments. Continued close cooperation with County Boards of Supervisors and Planning Departments will need to take place during the implementation of the selected alternative to avoid future conflicts. This cooperation is particularly important in the areas of land uses and road development and use.

J Energy Requirements and Conservation Potentials of Alternatives

Energy Consumption. Estimates of energy consumption by alternative include energy used for administration, road construction/reconstruction, timber harvest, recreation, fire management, watershed management, and grazing. These estimates were measured in terms of gallons of gasoline and diesel fuel used and converted to British thermal units (BTUs). Worksheets used in these calculations are included in the planning records available at the Forest Supervisor's Office, 2400 Washington Avenue, Redding, California.

Energy consumption related to timber management activities accounts for about 80 percent of the average annual use under each alternative. The calculation for timber energy consumption was based on the amount of petroleum products used in timber harvesting operations and associated road building activities.

Energy Produced. Estimates of energy produced by alternative used the same categories shown above for energy consumption. Water yield accounted for 94 percent of the total energy produced on the Shasta-Trinity National Forests.

Energy Requirements. The following conclusions can be made on the effect of alternatives on the energy resources of the Shasta-Trinity National Forests:

--The inclusion of energy produced by water yields is misleading and tends to skew the overall energy efficiency of the alternatives. The presence of the Central Valley Project involving the Sacramento and Trinity River Basins, plus the Shasta Dam, further exaggerates this situation;

--By excluding water yields (most of which are beyond the administrative control of the National Forests), it is obvious that, as one intensifies commodity outputs, less efficient use of energy occurs. However, differences between alternatives are predictable;

--Differences between alternatives from the standpoint of net energy requirements (budget) are insignificant; and

--The increased energy consumption in the high-output alternatives indicated by this analysis is balanced by the increased opportunities for additional biomass utilization. Some of this could be converted to energy production as technology and economic conditions permit.

CHAPTER V

List of Preparers

CHAPTER V
List of Preparers

Primary responsibility for the preparation of the proposed Forest Plan and Draft EIS was held by the Land Management Planning Group and Interdisciplinary (ID) Team. In addition, the Forests' Line Officers, consisting of the Forest Supervisor, Deputy Forest Supervisor, and the District Rangers, provided additional input to the planning process from a managerial viewpoint.

Throughout the preparation of these documents, many individuals assisted in a variety of ways. Without their expertise, ideas, and opinions, the writing of these documents would not have been possible.

Land Management Planning Group

Core Team Members

Steven Clauson — Land Management Planner

Experience: Land Management Planning Staff Officer and ID Team Leader; District Ranger. Shasta-Trinity National Forests (N.F.): 1 year; 12 years, respectively. LMP Staff, Cleveland N.F., 1 year. Forest Service: 23 years

Education: B.S. Mech. Engineering

John Kruse — Physical Sciences

Experience: Physical Sciences Staff Officer (water, soils, geology, minerals); Land Management Planning Staff Officer and ID Team Leader. Shasta-Trinity N.F.: 6 years; Forest Service: 27 years

Education: B.S. Forestry

Ralph Phipps — Environmental Coordinator

Experience: Staff Silviculturist, 3 years; Silviculture, Resource Planning, Timber Management, 12 years. Shasta-Trinity N.F.: 15 years

Education: B.S. Forest Management

Arlene Kallis — Forest Planning Analyst

Experience: Planning and Database Management Staff, Shasta-Trinity N.F.: 6 years: FORPLAN Analyst, GIS Coordinator. Ranger District experience, 9 years: Silviculture, Small Sales, Sales Preparation and Layout

Education: B.S. Forest Management

Jim Zander — Timber

Experience: Timber Management Planning and Silviculture. Shasta-Trinity N.F.: 13 years; Forest Service: 29 years

Education: B.S. Forestry

Technical Support

Janet Buzzini — Writer-Editor

Experience: Writer-Editor; Public Affairs Officer. Shasta-Trinity N.F.: 12 years; Forest Service: 30 years

Education: A.A. Degree

Stephanie Arnaud — Environmental Documents

Experience: Desktop Publishing, Computer Graphics; Database Auditing. Shasta-Trinity N.F.: 5 years; January 1993, respectively

Education: College coursework; certificates in computer software and repair

Mary Cavalleri — Editorial Assistant

Experience: Editorial Assistant; Desktop Publishing, Computer Graphics. Shasta-Trinity N.F.: 2 years; 5 years, respectively; Forest Service: 9 years

Education: College coursework

Ken DeCamp — Illustrator

Experience — Illustrator. Shasta-Trinity N.F.: 12 years. Teaching, Botany, Mycology, Art, 10 years; Design and Illustration (private studio), 7 years; Fine Arts, 23 years; Forest Service: 12 years

Education — B.A. Geography; M.A. Geography and Education; Equivalent A.A., English; Certificate, Graphics and Mapping

Line Officers

Steve Fitch — Forest Supervisor

Experience — Forest Supervisor, Shasta-Trinity N.F.; Forest Supervisor, National Forests in Florida; Deputy Forest Supervisor, North Carolina; Chief's Planning Staff, Washington, D.C.; Assistant to U.S. Senator, Washington, D.C.; District Ranger, Shasta-Trinity N.F.; Recreation Staff Officer, Inyo N.F. Forest Service: 29 years

Education — B.S. Forest Management Science

Robert Tyrrel — Forest Supervisor - retired 1992

Experience — Forest Supervisor (3 National Forests); District Ranger (2 National Forests); Staff Officer - Public Affairs, Fire, Soils & Water; Staff Director Program, Planning and Budgeting (PP&B). Shasta-Trinity N.F.: 8 years; Forest Service: 35 years

Education — B.S. Forest Management

William Carpenter — Deputy Forest Supervisor

Experience — Deputy Forest Supervisor; Program Officer; District Ranger; Timber Management Assistant. Shasta-Trinity N.F.: 10 years; Forest Service: 33 years

Education — B.S. Forest Management

Charley Fitch — District Ranger, Big Bar Ranger District

Experience — District Ranger; District Resource Officer; Forest Management; Silviculturist. Shasta-Trinity N.F.: 15 years; Forest Service: 27 years

Education — B.S. Forest Management

Karyn Wood — District Ranger, Hayfork Ranger District

Experience — District Ranger; District Fire Management Officer; Recreation Staff Assistant, Assistant Fire Management Officer, Fuels Forester, Timber Sale Administrator, Sale Preparation Officer. Shasta-Trinity N.F.: 3 years; Forest Service: 18 years

Education — B.S. Forest Management

Robert Hammond — District Ranger, McCloud Ranger District

Experience — District Ranger (2 National Forests); Resource Officer; Timber Management Officer; Administration Forester. Shasta-Trinity N.F.: 9 months; Forest Service: 26 years

Education — B.S. Forest Management

Kathy Hammond — District Ranger, Mt. Shasta Ranger District

Experience — District Ranger (2 National Forests); Public Affairs Officer; Resource Officer; LMP ID Team Leader; Dispersed Recreation/Wilderness Area Manager. Shasta-Trinity N.F.: 9 months; Forest Service: 15 years; BLM: 3 years

Education — B.S. Natural Resource Management

Shawne Mohoric — District Ranger, Shasta Lake Ranger District

Experience — District Ranger; Wildlife Biologist, 3 districts; Multi-disciplinary Resource Officer, 2 districts. Shasta-Trinity N.F.: 6 months; Forest Service: 13 years

Education — B.S. Biology; B.S. Wildlife Science

Irl Everest — District Ranger, Weaverville Ranger District

Experience — District Ranger (2 National Forests); Resource Officer; Lands and Resource Officer; Forester Rights-of-Way and Timber Management. Shasta-Trinity N.F.: 9 years; Forest Service: 27 years

Education — B.S. Entomology; B.S. Forest Management

Robert Ramirez — District Ranger, Yolla Bolla Ranger District

Experience — District Ranger; Planning Forester; District Silviculturist; Forester; Silvicultural Assistant. Shasta-Trinity N.F.: 3 years; Forest Service: 19 years

Education — B.S. Forest Management

Leadership Team

Jerry Brogan — Timber Management

Experience — Timber Management Officer (TMO); District Ranger; Deputy TMO; District TMO. Shasta-Trinity N.F.: 7 years; Forest Service: 31 years

Education — B.S. Forestry

Ken Coop — Range, Ecology, Wildlife, Fisheries, Botany

Experience — Biological Sciences Staff Officer; Fish/Wildlife Staff Officer; Botany Range, Ecology Staff Officer. Shasta-Trinity N.F.: 12 years; 9 years, respectively. Regional Area Game Management Biologist, Montana Fish & Game Department: 6 years; Dixie & Fishlake National Forests Zone Wildlife Biologist, 2 years; Klamath National Forest Wildlife Biologist, 2 years. Shasta-Trinity N.F.: 12 years; Forest Service: 16 years

Education — A.S. Science/Biology; B.S. Wildlife Conservation & Ecology; M.S. Fisheries &Wildlife Management

Duane Lyon — Rural Development, Bio Region Coordinator, Cultural Resources, and Tribal Government Liaison Officer

Experience — Forest Recreation Officer; Forest Land Management Planning Officer; Recreation Planning at Regional Level; Recreation and Visual Resource Management at Forest, Regional, and Washington Office levels. Shasta-Trinity N.F.: 12 years; Forest Service: 26 years

Education — B.S. Landscape Architecture

Royal Mannion — Public Information

Experience — Public Affairs Officer; District Ranger; Timber Sale Planning; Resource Officer; Recreation Officer; Forester. Shasta-Trinity N.F.: 13 years; Forest Service: 29 years

Education — B.S. Forest Management

Frank Packwood — Special Agent

Experience — Supervisory Criminal Investigator, Shasta-Trinity N.F.: 10 years; Forest Service: 27 years

Education — Federal Law Enforcement Training Center-Criminal Investigator School; College coursework

Thomas Pestotnik — Engineering

Experience — Forest Engineer. Shasta-Trinity N.F.: 17 years; Forest Service: 29 years

Education — B.S. Civil Engineering

Kenneth Showalter — Recreation/Lands

Experience — Forest Recreation/Lands Staff Officer; District Ranger; Timber Management Officer; Recreation Officer; Program Planning and Budget Officer; Land Management Planning Team. Shasta-Trinity N.F.: 15 years; Forest Service: 28 years

Education — B.S. Forest Management

Bill Swanson — Fire Management - Retired 1993

Experience: Fire Management Officer, Shasta-Trinity N.F., 4 years. Forester, Tahoe N.F., 3 years; District Timber Management Officer, Shasta-Trinity N.F., 3 years; Assistant District Ranger, Sequoia N.F., 2 years; District Ranger, Lassen N.F., 18 years; Fire and Lands Staff Director, Lassen N.F., 5 years

Education: B.S. Forest Management

Other Specialists

Paula Crumpton — Wildlife Biologist

Experience: Wildlife Biologist, Shasta-Trinity National Forests: 3 years; Wildlife Biologist, Gifford Pinchot N.F.: 6 years; Wildlife Biologist, Cibola N.F.: 3 years; Seasonal Biologist, Six Rivers N.F.: 1 year. Forest Service: 13 years

Education: B.S. Wildlife Management

Gregg DeNitto — Pest Management

Experience: Plant Pathologist. Northern California Forest Pest Management Service Area. Shasta-Trinity N.F.: 4 years; Forest Service: 13 years

Education: Ph.D. Forest Pathology

John Guthrie — Fire Management - retired 1992

Experience: Assistant Forest Fire Management Officer; Forest Fire Management Specialist; Forest Fire Dispatcher; Fire Management Officer. Shasta-Trinity N.F.: 13 years; Forest Service: 33 years

Education: College coursework

Don Haskins — Geology

Experience: Forest Geologist; Geologist-Watershed Management. Shasta-Trinity N.F.: 12 years; Forest Service: 16 years

Education: B.S. Geology; M.A. Geology

Winfield Henn — Cultural Resources

Experience: Forest Archaeologist; City Planning Commissioner; City General Planning Committee. Shasta-Trinity N.F.: 16 years; Forest Service: 16 years

Education: B.A. Anthropology; M.S. Anthropology; Ph.D Anthropology

Kristy Hern — Recreation

Experience: Assistant Recreation and Lands Staff Officer. Shasta-Trinity N.F.: 4 years. District Special Uses Specialist: 6 years; Recreation Supervisor: 4 years. Forest Service: 17 years

Education: B.A. Outdoor Recreation

Nancy Hutchins — Wildlife Management

Experience: District Wildlife Biologist, Shasta-Trinity N.F.: 8 years; Ochoco N.F.: 3 years. Forest Service: 11 years

Education: B.S. Forestry and Wildlife Management

Richard Irizarry — Fisheries

Experience: Fisheries Biologist; Research Biologist; Fish Culturist. Shasta-Trinity N.F.: 11 years; Forest Service: 15 years

Education: B.S. Fisheries Management; Graduate coursework

Patrick Kennedy — Recreation-Visual Management

Experience: Forest Landscape Architect, Recreation-Visual Management/Planning. Supervisory Forest Landscape Architect (3 National Forests). Shasta-Trinity N.F.: 18 years; Forest Service: 30 years

Education: B.A. Landscape Architecture

Sheila Logan — Ecology

Experience: Zone 3 Ecologist, Ecological Classification and Ecological Unit Inventory, Shasta-Trinity and Mendocino N.F.: 4 years; Forest Service: 14 years

Education: B.S. Plant Ecology; M.S. Forest Ecology

Vivian Long	Botany
Experience	Botanist, Shasta-Trinity N.F., 1 year; Seasonal Sensitive Plant Technician, 1 year
Education	B.S. Biology with emphasis in Botany
Julie Nelson	Botany
Experience	Forest Botanist, Shasta-Trinity N.F.: 4 years; Forest Service: 4 years. Berry Botanic Garden Conservation Director, 6 years; Consulting Botanist, 4 years
Education	B.S. Botany; M.S. Biology
Darrel Ranken	Soils and Water
Experience	Forest Hydrologist; Water Quality Management; Watershed and BMP Monitoring; Watershed Restoration; Water Resource Inventory; Fluvial Processes and Channel Dynamics. Shasta-Trinity N.F.: 15 years; Forest Service: 18 years
Education	B.S. Forest Management; M.S. Forest Hydrology
David Schultz	Pest Management
Experience	Entomologist. Forest Pest Management Northern California Shared Service Area. Shasta-Trinity N.F.: 5 years; Forest Service: 16 years
Education	B.S. Forestry; Ph.D. Forest Entomology
Jim Stoll	Engineering
Experience	Assistant Forest Engineer. Shasta-Trinity N.F.: 4 years; Forest Service: 14 years
Education	B.S. Civil Engineering
Jim Turner	Program Analysis Officer
Experience	Financial Planning, economics, operations research. Shasta-Trinity N.F.: 15 years; Forest Service: 23 years
Education	Bachelor of Science, Colorado State University, Economics, Physical Sciences; Master of Science, Colorado State University, Economics, Operations Research

CHAPTER VI

Agencies, Organizations, and Individuals

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Agencies, Organizations, and Individuals

The Draft Environmental Impact Statement (Draft EIS) for the proposed Forest Plan was distributed to agencies, organizations, and individuals as required by National Environmental Policy Act (NEPA) regulations (40 Code of Federal Regulations [CFR] 1502.19). Prior to release for public review and comment, those organizations and individuals on the Forest planning mailing list were notified of the availability of the documents. The organizations and individuals listed below requested copies of the planning documents. Although more than one department or office of an agency or organizaiton may be a recipient, the agency or organization is listed only once.

This list is not complete, but it gives an indication of the number of copies that have been distributed. The complete mailing list is on file at the Forest Supervisor's Office, 2400 Washington Avenue, Redding, CA.

This list will be expanded for the Final Environmental Impact Statement (Final EIS) to include any agency, organization, or member of the public who submits comments on the Draft EIS. In the Final EIS, this chapter will also contain responses to comments received on the Draft EIS in the manner specified by the Council on Environmental Quality (CEQ) in 40 CFR 103.4. This section in the CEQ regulations further identifies the need to attach the comments received and the manner in which the comments will be treated.

City, County, Federal and State Officials

Cities

City Manager, Tony Lopez - Corning
Mayor, Ann Cannon - City of Anderson
Mayor, Len Albright - City of Dunsmuir
Mayor, Russ Porterfield - City of Mt. Shasta
Mayor, Velma Trujillo - City of Red Bluff
Mayor, Charles Moss - City of Redding
Mayor, Jim Gubetta - City of Weed

Counties

Humboldt
Board of Supervisors

Modoc
Administrative Officer
Board of Supervisors

Shasta
Board of Supervisors
Planning Commision
Planning Director
Public Works Director
Superintendent of Schools

Siskiyou
Board of Supervisors
Planning Commision
Planning Director
Public Works Director
Superintendent of Schools

Tehama
Board of Supervisors
Planning Commision
Planning Director
Public Works Director
Superintendent of Schools

Trinity
Board of Supervisors
Planning Commision
Planning Director
Public Works Director
Resource District
Superintendent of Schools
Transportation Planning

Federal
Congressman Dan Hamburg
Congressman Vic Fazio
Congressman Wally Herger
Senator Dianne Feinstein
Senator Barbara Boxer

State
Assemblyman Stan Stathem
Attorney General Dan Lungren
Senator M. Thompson
Senator Tim Leslie

Educational Institutions

Chico State University
College of the Siskiyous
Hayfork High School
Humboldt State University
John Muir Institute
Mt. Shasta High School
Shasta College
University of California at Berkeley
University of Pennsylvania
University of Southern Alabama
University of Wyoming

Federal Agencies

Advisory Council on Historic Preservation
Agriculture, U.S. Department of (USDA)
- Animal & Plant Health Inspection Service
- Forest Service
- Office of Equal Opportunity
- Office of General Council
- Rural Electrification Administration
- Soil Conservation Service
- Stabilization & Conservation Service

Commerce, U.S. Department of (DOC)
- Habitat Conservation Division
- NOAA Ecology & Conservation Division

Defense, U.S. Department of (DOD)
- Chief Naval Operations
- Corp of Engineers, U.S. Army
- Deputy Assistant Secretary of Defense
- Deputy Assistant Secretary of the Air Force
- Engineers & Housing, U.S. Army
- Explosives Safety Board

Delaware River Basins Commissions
Energy, U.S. Department of (DOE)
Environmental Protection Agency (EPA)
EIS Review Coordinator, San Francisco, CA
Federal Agency Liason Division
Federal Energy Regulatory Commission (FERC)
General Services Administration (GSA)
Health & Human Services, U.S. Dept. of (HHS)
Housing and Urban Dev, U.S. Dept. of (HUD)
Interior, U.S. Dept. of (USDI)
- Bureau of Indian Affairs
- Bureau of Land Management
- Bureau of Reclamation
- Fish & Wildlife Service
- National Park Service

Interstate Commerce Commission (ICC)
Labor, U.S. Dept. of
Transportation, U.S. Dept. of (DOT)
- U.S. Coast Guard
- Environmental Division
- Federal Aviation Administration
- Federal Highway Administration
- Federal Railroad Administration
- Pipeline Safety, Office of

Libraries

Chico State University
College of the Siskiyous
Colorado State University
Dunsmuir Branch Library
Humboldt State University
Klamath-Trinity Library
Shasta College
Shasta County (main branch)
Shasta County (Anderson)
Shasta County (Burney)
Sierra Club
Siskiyou County
Tehama County (Red Bluff)
Trinity County (Hayfork)
Trinity County (Trinity Center)
Trinity County (Weaverville)
University of California (Berkeley)

Native American Tribal Leaders/Organizations

Big Bend Rancheria
California Council of Tribal Governments
Local Indians for Education
Montgomery Creek Rancheria
Northern California Indian Development Council
Pit River Tribal Council
Roaring Creek Rancheria
Shasta Nation, The
Winimen Wintu Camp Organization
Wintu Education and Cultural Council

Organizations

American Motorcycle Association
Audubon Society
Calif. Association of 4WD Clubs
Calif. OHV Association
CAL Trout
Calif. Forestry Association
Calif. Wilderness Coalition
Citizen's Committee to Save Our Public Lands
Citizens for Better Forestry
Far West Motorcycle Club
Federation of Fly Fishers
Friends of Chinquapin
McCloud River Preserve
Mendocino Environmental Center
Minerals Exploration Coalition
National Resources Defense Council
Northcoast Environmental Center
SHARE
Shasta Lake Boaters Associaton
Shasta Miners & Prospectors
Sierra Club
Tehama Alliance
The Fund For Animals
United 4-Wheel Association
Wilderness Society
WRC Environmental
Yolo Environmental Resources Center

State Agencies

California
- Boating & Waterways, Dept. of
- Board of Forestry
- CALTRANS Districts 01 & 02
- Department of Justice
- Clearing House
- Farm Bureau FB-12
- Fish and Game, Dept. of
- Forestry & Fire Protection, Dept. of
- Highway Patrol
- Lands Commission

Native American Heritage Commission
Parks & Recreation, Dept. of
Planning & Research, Office of
Regulatory Water Quality Control Board
Resource Conservation Districts
State Clearing House
Water Resources Board
Water Rights, Division of

Other/Individuals

Allan, Michael & Linda
American Forest & Paper
Aramayo, Robert
Bailey, Mark
Ballew, Larry
Baltic, Tony
Bartson, Andy
Battaglia, Phillip
Beatty, Kenneth
Belli, Vince J.
Berditschevsky, M.
Berg, Bill
Biery, Ed
Blomstrom, Greg
Blum, Frank B., Jr.
Bollibokka Land Company
Bolton, June
Borg, Lennea
Bower, Joseph & Susan
Bowker, Lee - Dean
Bradford, Carlton & Joy
Calomiris, John, P.E.
Carlson, Bertha
Cedar Stock Resort
Champion Timberlands
Christopher, Richard
Coleman, Charles
Colson, Chris
Cook, Walter
Cox Family
De Jager, William R.
Dederian, Rich
Depree James W.
Douglas, Claude
Downer, Craig C.
Eissler, Fred
Ely, george
Engstrom, Tom
Erosion control Inc.
Evans, Willis A.
Farrar, Wm R. Jr.
Ford, David Ralph
Garrett, Lawrence
Geddie, John
Gilless, Keith
Green, Randy
Gunn, Lynn
Harkin, Don
Harris, Marilyn
Hart, John
Hearst Corporation
Hercsuth, Emil Albert
Higby, Wesley
High Ridge Lumber Company
Hinman, Bill
Hoekstra, Bud & Maurie
Holquist, Robert C.
Hrubes, Robert
Hunt, Buel B.
Jackson, Michael
James, Karen
Jensen, Gregory P.
Johns, William
Kinyon, Carey G.
Kloefkorn, Walter
Kottinger, Jim
Krol, Robert
Krueger, David S.
La Pre, Lawrence F.
Lake, Larry
Laughing Heart Adventures
Mackay, Steve
Mannion, Denise
Marr, Tom
Mason, Tad
McDowell, Richard
McMaster, Ken
Mecchi, Donald E.
Meyer, Bill & Dianne
Middleton, Jim
Miller, Carla
Miller, Ronald W.
Miyoshi, Mark
Morris, Don
Moses, Robert E.
Mueller, Emil J.
Munroe, Dean
Nardi, Michael
Nowacki, Doug
Orre, Ed
Pace, Felice
Pacific Gas & Electric
Palmer, Neil
Parton, Glenn
Perske, Douglass
Ponting, Gordon
Power Engeneers
Rapf, Marni & John
Ravizza, Thomas J.
Refkin, Mike
Renouf, Rich
Rocky, J.
Rogers, Ron
Rosa, Nicholas
Roseburg Resources Co.
Roth, Barry Ph.D
Rourke, Mike
Rowland, Greg
Sanders, Dee W.
Sanderson, Terry & Winke
Sattler, Ronald J.

Sawyer, John
Schimps, Erich F.
Shaw, Robert H.
Sierra Pacific Industries
Simmen, Eric
Slater, Jerry
Smith, Michael
Smith, Mike
Steffenson, May Lee
Steger, Eric D.
Stokes, Jim
Storm, Donald
Streamfellow, Dwight
Toler, Irvin E.
Towle, Phil
Truman, Patrick
Van Epps, Charles P.
Verrill, Wayne
Vinyard, Lucille
Vulcan Power Company
Weidenkeller, Roland
Weidert, Carl & Stanley
Weseloh, Tom
Western Timber Service
Willard, Dwight
Wilson, Karen
Wilson, Harry E.
Windus, Walter
Wright, Graham J.
Yoshioka, Glenn

CHAPTER VII

Bibliography

CHAPTER VII
Bibliography

Alexander, Earl B. "Relative Chance for Survival of Planted Conifer Seedlings Based on Physical Site Factors in California". U.S. Department of Agriculture (USDA), Forest Service, Unpublished Forest Service Report, 1981

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CHAPTER VIII

Glossary

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Glossary

Abbreviations

Listed below are abbreviations and acronyms used in the Draft EIS and proposed Forest Plan. An asterisk means it is further defined in this glossary (see Definitions).

AMS	Analysis of the Management Situation*
AQRV	Air Quality Related Values
ASQ	Allowable Sale Quantity*
AM	Animal Month*
BLM	Bureau of Land Management
BMPs	Best Management Practices*
BSS	Base Sale Schedule*
CALTRANS	California Department of Transportation
CDF	California Department of Forestry & Fire Protection
CFS	Cubic Foot per Second*
CHA	Critical Habitat Area*
CHU	Critical Habitat Unit*
CMAI	Culmination of Mean Annual Increment*
DCA	Designated Capability Area*
DBH	Diameter at Breast Height*
DFC	Desired Future Condition*
DFG	California Department of Fish and Game
EA	Environmental Assessment*
EPA	Environmental Protection Agency
ERA	Equivalent Road Acre*
EUI	Ecological Unit Inventories*
FUD	Fish User Day*
FWIP	Forest Watershed Improvement Program
GIS	Geographic Information System*
GRI	Geologic Resource Inventory
GTR	Green Tree Retention*
HCA	Habitat Conservation Area*
IAP	Interim Artificial Propagation*
IPM	Integrated Pest Management*
KGRA	Known Geothermal Resource Area
LAC	Limits of Acceptable Change
LTSY	Long Term Sustained Yield*
MBF	Thousand Board Feet
MIRs	Minimum Implementation Requirements*
MIS	Management Indicator Species* or Management Indicator Assemblages*
MMBF	Million Board Feet
MMRs	Minimum Management Requirements*
NASA	National Aeronautical & Space Administration
NEPA	National Environmental Policy Act*
NFMA	National Forest Management Act*
NPBs	Net Public Benefits*
NTMB	Neotropical Migratory Birds*
OHV	Off-highway Vehicle*
PAOT	People-at-one-time*
PNV	Present Net Value*
RAMPREP	Resource Allocation Model Preparation*
RARE	Roadless Area Review and Evaluation
RIM	Recreation Information Management*
RMZ	Riparian Management Zone
RN	Roaded Natural (see Recreation Opportunity Spectrum [ROS])*
RNA	Research Natural Area*
RPA	Forest and Rangeland Renewable Resources Planning Act of 1974*
ROS	Recreation Opportunity Spectrum*
RVD	Recreation Visitor Day*
SAOT	Skiers-at-one-time*
SIA	Special Interest Area*
SPM	Semi-primitive Motorized (see ROS)*
SPNM	Semi-primitive Non-motorized (see ROS)*
SRI	Soils Resource Inventory
TE&S	Threatened, Endangered, and Sensitive Species*
TOC	Threshold of Concern*
TSI	Timber Stand Improvement*
USC	United States Code
USGS	U.S. Geological Survey
VAC	Visual Absorption Capability*
VQI	Visual Quality Index*
VQO	Visual Quality Objective*
WARS	Wilderness Attribute Rating System*
WHR	Wildlife Habitat Relationship*
WRC	Water Resource Council, U.S.
WUD	Wildlife User Day*

Definitions

This glossary gives definitions of terms in the Draft EIS and proposed Forest Plan.

A

"aa" type lava flow

[Pronounced ah ah.] A Hawaiian term for basaltic lava flows typified by a rough, jagged, spinose, clinkery surface (Dictionary of Geological Terms, Doubleday 1976).

acre-foot

The volume of water or sediment equal to the amount that would cover one acre to a depth of one foot (43,560 cubic feet; 326,000 gallons).

adfluvial

Refers to lake-dwelling fish that ascend streams to spawn, like kokanee.

adopted visual quality objective

The level of visual quality to which the landscape will actually be managed (see visual quality objective [VQO]).

allocation

The assignment of sets of management practices (prescriptions) to particular land areas to achieve the goals and objectives of the alternative.

allowable sale quantity (ASQ)

The quantity of timber that may be sold from the area of suitable timber land in an alternative. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity". ASQ is normally expressed in board feet or cubic feet.

Alquist-Priolo Special Fault Study Zones

The Alquist-Priolo Special Studies Zones Act was enacted in 1976 by the California Legislature with the purpose of providing maps of specific seismic hazards, or earthquake potential. These maps are used to regulate development near active faults in order to mitigate the hazard of surface fault-rupture. Regulation within the zones is carried out mainly by the cities and counties that issue development permits.

alternative

In forest planning, a given combination of resource uses and a mix of management practices that achieve a desired management direction, goal, or emphasis.

ambient air quality

Air quality environment.

amenity (amenity value)

Typically used in land management planning to describe those resources for which market values (or proxy values) are not or cannot be established.

anadromous fish

Those species of fish that live in saltwater most of their lives, after migrating from their fresh water beginnings. As adults, they migrate back into fresh water streams to spawn. Examples are salmon, steelhead and shad.

analysis area

An analysis area is an aggregate of capability areas that responds in a uniform way to a given management prescription.

analysis of the management situation (AMS)

A step in forest planning in which the forests' ability to supply goods and services in response to society's demand for those goods and services is determined.

animal month (AM)

The quantity of forage required by one mature cow for one month. (For land management planning purposes, the Pacific Southwest Region uses 1,000 pounds/month or 30 pounds/day.)

area of influence

A delineated geographic area within which the present or proposed actions of a forest unit exert an important influence on residents and visitors.

arterial (road)

See "road"

aspect

The compass direction that the slope of a land surface faces (e.g., north, northwest, south).

assessment

The renewable resources assessment required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA).

assigned value

A monetary value that represents the price consumers would be willing to pay for the Forests' outputs, whether or not such prices are actually paid

to the Federal Government. In forest planning the term "assigned value" refers to both market and non-market outputs, because it is National policy to provide most of the forests' outputs at either no charge to consumers or at a price less than the willingness to pay.

B

background

View beginning 3 to 5 miles from the observer and as far into the distance as the eye can detect the presence of objects. Skylines or ridge lines against other land surfaces are the strongest visual elements of the "background."

background level (background, natural background level)

The environmental conditions that exist prior to active management taking place.

backlog

Work which needs to be completed by the Forest Service, such as reforestation, timber stand improvement, slash disposal, and land line location.

basal area

The cross-sectional area of a stand of trees measured at 4.5 feet above the ground, expressed in square feet.

base sale schedule (BSS)

A timber sale schedule formulated on the basis that the quantity of timber planned for sale and harvest for any future decade is equal to or greater than the planned sale and harvest for the preceding decade. This planned sale and harvest for any decade is not greater than the long-term sustained yield capacity.

benchmark

An analysis of the supply potential of a particular resource, or of a set of resources subject to specific management objectives or constraints. Benchmarks define the limits within which alternatives can be formulated.

benefit

The total value of output or other outcome. (Negative or non-beneficial outputs or effects should be included in total benefits.)

benefit-cost analysis

An analytical approach to making choices on the basis of receiving the greatest benefit for a given cost or producing the required level of benefits at the lowest cost. The same analytical process has also been referred to as cost effectiveness analysis when the benefits cannot be quantified in terms of dollars.

benefit-cost ratio

Measure of economic efficiency, computed by dividing total benefits by total costs. Usually both benefits and costs are discounted to present values.

best management practices (BMPs)

A practice or a combination of practices that have been determined to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. These practices have been certified by the State of California Water Resources Control Board and approved by the Environmental Protection Agency as the best means to control nonpoint pollution.

biolink

See "Trinity Divide Biolink".

biological growth potential

The average net growth attainable in a fully stocked natural forest stand (or land).

biomass

The total mass (e.g., weight, volume) of living organisms in a biological system (Odum, 1971). For purposes of this document, biomass is the aboveground portions of shrubs and trees, excluding material that meets commercial sawlog specifications.

biological diversity, or biodiversity

Species diversity - i.e., number of different species occurring in a location or under the same condition. It also refers to the variety of habitats and conditions in an area.

board foot

Lumber or timber measurement term. The amount of wood contained in an unfinished board 1 inch thick, 12 inches long, and 12 inches wide.

bone-dried (tons)

A measurement of biomass; wood dried to a constant weight with a standard moisture content of 10% (oven dried).

broadcast burning

A technique of applying fire to target fuels which ignites all burnable materials over the entire unit being treated.

browse

Leaf and twig growth of shrubs, woody vines. Also shrubs and/or trees favorable and available for animal consumption.

burning prescription

Written direction stipulating fire environment conditions, techniques, and administrative constraints necessary to achieve specified resource management objectives by use of fire on a given area of land.

buy-out

Federal Timber Contract Payment Modification Act (98 STAT. 2213; 16 U.S.C. 618). Allows timber companies to buy out of timber sale contracts at a reduced amount in lieu of the original contract price.

C

canopy

The more or less continuous cover of leaves and branches collectively formed by the crowns of adjacent trees in a stand or forest. Canopy cover varies by the number of trees in an area.

capability

The potential of an area of land to produce resources, supply goods and services, and allow resource uses under an assumed set of management practices and at a given level of management intensity. Capability depends upon site conditions such as climate, slope, landform, soils, and geology, as well as the application of management practices, such as silviculture or protection from fire, insects, and disease.

capability area

The smallest unit of land or water used in forest planning. A discrete and recognizable unit, classified primarily according to physical (soil), administrative, and biological factors. All land within a capability area is homogeneous in ability to produce resource outputs and in production limitations.

carrying capacity

The number of individuals in a given species that can survive in, and not cause deterioration to, an ecosystem through the least favorable environmental conditions that occur within a given interval of time.

chain

A measure of distance equivalent to 66 feet.

chaparral

A vegetation community that consists primarily of shrub species such as chamise and ceanothus.

chargeable volume

All volume that is included in the growth and yield projections for the selected management prescriptions used to arrive at the allowable sale quantity, based on Regional utilization standards. Consistent with the definition of timber production, planned production of firewood is not included in the allowable sale quantity and therefore is non-chargeable.

class (with regard to visual quality)

For visual condition classes, see "visual condition".

class I area

An area designated for the most stringent degree of protection from future degradation of air quality. The Clean Air Act designates as Mandatory Class I areas each National Park over 6,000 acres and each national wilderness over 5,000 acres, that was designated with the passage of the 1964 Wilderness Act.

Clean Water Act

Law enacted by the United States Congress in 1972, as amended in 1977 and 1980, whose objective is to restore and maintain the chemical, physical and biological integrity of the Nation's water.

clearcutting

Removal of all the merchantable trees in a stand in one cutting operation to help establish a new even-aged stand. Clearcutting does not necessarily mean that all unmerchantable trees are removed.

climax

The culminating stage in plant succession for a given site where the vegetation has reached a highly stable condition. See "succession".

coldwater fishery

Stream and lake waters which support predominantly coldwater species of fish. These fish have maximum sustained water temperature tolerances of about 70 degrees Fahrenheit. Salmon and trout are examples.

collector road

See "road".

commercial species

Tree species, such as Douglas-fir and ponderosa pine, suitable for industrial wood products.

commodity

A transportable resource product with commercial value.

community cohesion

The degree of unity and cooperation within a community in achieving its goals.

community stability

The capacity of a community to absorb and/or cope with change without major hardships to groups or institutions within the community.

compatible uses

Land uses which can exist together so that no one use improves or detracts from the quality of another. In practice this definition is usually relaxed to include uses which can coexist and conflict only slightly.

conflicting uses

Land uses by which the quality of each individual use is harmed by the other's uses when they occur together in the same area. This is due either to competition for limited resources or from by-products which damage alternative uses.

constraint

Limitations; actions which cannot, or must be taken.

consumer surplus

The difference between the total cost to consumers for a good or service and the amount each individual would be willing to pay rather than do without it.

consumptive use

Use of a resource that reduces the supply.

consumptive wildlife

Animal species that are hunted or trapped such as deer, quail, or beaver.

cool burn prescriptions

Prescriptions that result in low intense flames.

cord

A stack of wood measuring 4 feet high, 4 feet deep, and 8 feet long. In wood volume, two cords equal roughly 1,000 board feet.

corridor

A linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries. An area that provides connectivity or migration routes for wildlife to travel between habitats. Streamside areas are an example.

cost

The price paid or what is given up in order to acquire, produce, accomplish, or maintain anything.

cost, administrative

Costs of required general administration which are prorated over fixed, variable, and investment costs.

cost, economic

Total fixed and variable costs for inputs, including costs incurred by other public and private parties, and opportunity costs. Economic costs include adjustment for cost savings, and opportunity costs, if any.

cost-effective analysis

A benefit-cost analysis process utilized when all benefits of the alternatives cannot be quantified in terms of dollars (U.S. General Account. Office, 1969). Cost effectiveness analysis compares alternatives in terms of their contribution to a goal by using costs and other effectiveness criteria.

cost, fixed

Costs of the minimal level of activities committed for the planning period.

costs, maintenance level

Costs of activities needed to meet legal requirements (other than contractual) and costs needed to protect and maintain assets in the absence of controllable use.

cost, variable

Costs of program activities above the maintenance level.

cover type

Refers to actual stands of any vegetation type, whether dominated by tree, shrub, or grass species.

critical habitat area

Critical habitat area (CHA) and critical habitat unit (CHU) have been used interchangeably and for all intent and purpose, are one in the same. CHA/CHU is the specific area within a geographic area occupied by a species on which are found those physical and biological features (1) essential to the conservation of the species, and (2) that may require special management considerations or protection. A CHA/CHU normally would refer to a specific (U)nit or (A)rea of critical habitat and designated by a specific number, i.e., CHU34.

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crown

The upper part of a tree or other woody plant carrying the main branch system and foliage above a more or less clean stem(s).

cubic foot per second (CFS)

Unit of measure of streamflow or discharge, equivalent to 449 gallons per minute, or about 2 acre-feet per day.

culmination of mean annual increment (CMAI)

The point where the average annual growth of a stand of timber no longer increases.

cultural resources

Tangible and intangible aspects of cultural systems, living and dead, that are valued by a given culture or contain information about the culture. Cultural resources include, but are not limited to sites, structures, buildings, districts, and objects associated with or representative of people, cultures, and human activities and events.

cumulative watershed impacts

All impacts on beneficial uses of water and soil located outside of primary land use sites. They are the additive or synergistic effects of multiple actions within a watershed. Cumulative effects occur as a result of more than one action and the changes may either enhance or degrade water quality.

D

demand analysis

A study of the factors affecting the quantity and price of a good and/or service that would be used as purchased by consumers if made available.

demand schedule

The relationship between price and quantity demanded. The demand schedule expresses how much of the good or service would be bought or consumed at various prices at a particular point in time.

departure

A level of timber production that allows the planned sale and harvest to drop in a future decade (as opposed to non-declining yield). See "non-declining yield".

designated capability area (DCA)

A contiguous area of habitat to be managed and conserved for spotted owls.

designated wildlife areas

In reference to wildlife, specifically refers to lands presently identified (or those which may be identified) as displaying the proper habitat attributes necessary for or capable of helping to support a viable population of a given species. Field investigation, manual map overlays, and computer searches of the forests' land base may all assist in designating these areas. Key designated areas include important winter range, fawning areas, transition range, and roost sites.

desired future condition (DFC)

The desired conditon of the landscape expressed in terms of the biotic and abiotic components of the ecosystem and includes the social, economic and cultural elements.

developed recreation

A recreation development site outside of the National Wilderness Preservation System with suitable characteristics for accommodation of intensive recreation activities. Development sites can be either potential or existing.

diameter at breast height (DBH)

Diameter of a tree measured 4 feet 6 inches from the ground.

direct effect (primary effect)

A condition caused by an action or inaction without an intermediary causal agent; an effect characterized by a close causal relationship.

discounting

Discounting reduces future costs and benefits to reflect the decreased future value and enables comparisons to be made of benefits and costs occurring at different points in time.

discount rate

An interest rate that reflects the cost or time value of money. It is used in discounting future costs and benefits.

discretionary resources

Resources considered in the proposed Forest Plan where the choices of allocation are not limited by laws and/or regulations, or by unique, site-specific sets of physical-environmental requirements. Timber, recreation, and wildlife are examples of discretionary allocations.

dispersed recreation

Outdoor recreation that occurs outside planned and maintained recreational facilities (e.g., scenic driving, hunting, backpacking, and camping in undeveloped areas).

distance zones

Areas of landscapes denoted by specified distances from the observer. Used as a frame of reference in which to discuss landscape characteristics or activities of man.

disturbed

See "visual condition".

diversity

Variety of different plant and animal communities and species within the area.

drastic disturbance

See "visual condition".

E

ecological unit inventory (EUI)

The mapping of ecological units in a coordinated, interdisciplinary manner. Ecological unit inventories include ecological types of both terrestrial and aquatic ecosystems. National direction for ecological classification and inventory is contained in FSM 2060 and FSH 2090.11.

ecological type

A category of land having a unique combination of potential natural vegetation, soil, geomorphic process, landform, lithology, climate, and differing from other ecological types in its ability to produce vegetation and respond to management. Riparian areas and wetlands are included in terrestrial ecological types.

economic efficiency analysis

A comparison of the values of resource inputs (costs) required for a possible course of action with the values of resource outputs (benefits) resulting from such action. In this analysis, incremental market and non-market benefits are compared with investment and physical resource inputs.

ecotone

A transition zone between two or more vegetation communities. It may have considerable linear length and is narrower than the adjoining community areas themselves. The ecotonal community commonly contains many of the organisms of each of the overlapping communities and, in addition, organisms which are characteristic of and often restricted to the ecotone. Often, the number of species in the ecotone is greater than in the communities flanking it. Organisms which occur primarily or most abundantly or spend the greatest amount of time in junctional communities are often called "edge species."

endangered species

Any species listed as such in the Federal Register which is in danger of extinction throughout all or a significant portion of its range.

endemic organism

Species whose natural range is confined to a certain region and whose distribution is relatively limited.

environmental assessment (EA)

An analysis of alternative actions and their predictable short and/or long term environmental effects, which include physical, biological, economic, social, and environmental design factors and their interactions. An Environmental Assessment is the concise public document required by the regulations for implementing the procedural requirements of National Environmental Policy Act (NEPA).

ephemeral

Lasting or existing briefly; temporary.

ephemeral stream

A stream or reach of a stream that flows briefly only in direct response to storm run off or seasonal snowmelt and whose channel is at all times above the water table.

equivalent road acre (ERA)

A unit of measure used in cumulative watershed impact analyses which represents the equivalent disturbance of one acre of roaded area. Disturbances primarily include soil exposure and compaction.

erosion gully

The removal of soil by the formation of relatively large channels or gullies cut into the soil by concentrated surface runoff.

erosion, soil

The detachment and movement of soil from the land surface by wind and water.

erosion, surface

Erosion which removes materials from the surface of the land as distinguished from gully or channel erosion. The two main types of surface erosion are sheet erosion and rill erosion.

esthetics

Evaluations and considerations concerned with the sensory quality of resources (sight, sound, smell, taste, and touch) and especially with respect to judgment about their pleasurable qualities.

ethnographic

The study of contemporary cultural groups.

eutrophication

The natural process of maturing of a lake. In general, and within limits, productivity increases as a lake ages. An eutrophic lake may characteristically be shallow in depth and rich in nutrients. Littoral (shoreline) vegetation may be more abundant and plankton populations denser. Because of heavy organic content, summer stagnation may be severe enough to exclude coldwater fishes, however, a lake is probably suitable for perch, pike, bass, and other warmwater fishes. (Shasta Lake is a lake experiencing eutrophication unlike Trinity Lake which is referred to as an oligotrophic lake which means nutrient poor.)

evapotranspiration

The conversion of water, whether open or as soil moisture or within plants, into water vapor that is released to the atmosphere.

even-aged stand

A forest stand composed of trees having no, or relatively small, differences in age.

even-aged timber management

The combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of the stands of varying ages (and therefore tree sizes) throughout the forest area. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

extirpated

To wipe out or make extinct - some species have been extirpated from areas.

F

fine sediments

Small particles in the mixture of stream bottom (spawning) gravels that are less than 6.4 millimeters in size.

fire break

A natural or artificial barrier usually created by the removal of vegetation and used to prevent or retard the spread of fire.

fish habitat

The aquatic environment and the surrounding terrestrial environment that, combined, afford the necessary physical and biological support systems required by fish species during various life history stages.

fish user day (FUD)

Twelve hours of recreation use oriented to fish.

forage

All plants available for grazing or browsing by wildlife or harvested for feeding livestock.

forb

Any herbaceous plant other than those in the Gramineae (true grasses), Cyperaceae (sedges), and Juncaceae (rushes) families, e.g., wildflowers. A broad-leaved flowering herb whose stem above ground does not become woody and persistent.

foreground

The portions of a view between the observer and up to 1/4 to 1/2 mile distant. The surface patterns on objects and visual elements are important in the "foreground" portions of views. Observers are able to relate themselves to the size of individual visual elements (such as a tree) and are able to begin to sense their scale relationship to the landscape. Aerial perspective is absent or insignificant in the "foreground," and the intensity and lightness or

darkness colors are seen in maximum contrast. Wind motion in trees or on grass can be seen in this close-in area but seldom beyond.

Forest and Rangeland Renewable Resource Planning Act of 1974 (RPA)

An act of Congress that responded to the need for coordinated, long-range planning of resource uses within the National Forests.

forest cover type

A classification of forest land referring to a group of timber stands of similar development and species composition. Examples in California include Douglas-fir, mixed conifer, and the true fir types.

forest leadership team

Comprised of the Forest Supervisor, Deputy Forest Supervisor, principal staff members from the Forest Supervisor's Office, and District Rangers.

FORPLAN

A linear computer programming model used to assure that land allocations and output schedules for alternatives and benchmarks are made in a way that meets all constraints in the most cost-efficient manner possible. In addition to being used to formulate alternatives and benchmarks that are both feasible and cost efficient, FORPLAN is also used to perform detailed accounting work and to generate summary reports of information needed to construct the display tables in the Draft EIS.

fuel break

A wide strip of land strategically placed for fighting fires, where hazardous fuels have been replaced with less burnable fuels. Fuelbreaks divide fire-prone areas into smaller parcels for easier fire control and provide access for fire fighting.

fuel loading

The quantity of fuel per acre in a given area, expressed in tons per acre. Unless otherwise noted, this refers only to material which is dead or down on the forest floor.

fuels

Any material capable of sustaining or carrying a forest fire, usually natural material both live and dead. Downed logs and branches are examples.

G

geographic information system (GIS)

A computerized mapping system that enters, stores, updates, displays, analyzes, models and reports on information that is tied to known geographic locations.

goal

A concise statement that describes a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date for completion. Goal statements form the principal basis from which objectives are developed.

goods and services

The various outputs, including on-site uses, produced from forest and rangeland resources.

grazing

Consumption of meadow or pasture vegetation by livestock and wildlife such as elk.

green tree retention

The practice of retaining live, growing trees on a site during timber regeneration harvests as a future source of trees and snags for wildlife. An average of six to twelve trees per acre that exceed the average stand diameter are normally retained.

The definition is similar to the term "legacy retention" used by the Six Rivers National Forest, and the term "regeneration with reserves" used by the Klamath National Forest.

guideline

See standard and guideline.

H

habitat

A place where a plant or animal naturally or normally lives or grows. For wildlife, habitat is made up of four components: food, water, cover, and space.

habitat conservation area (HCA)

An area established for the conservation of northern spotted owl populations.

habitat element

A component of wildlife habitat. Snags and hardwoods are examples.

habitat matrix

A tabular valuation of wildlife habitat for all wildlife species.

hatchery

Any premises upon which breeding, hatching or fish-rearing facilities are situated when such premises are required to have a license by the state fish and game code, including ponds for commercial use.

herbicide

A substance used to inhibit or destroy plant growth. If its effectiveness is restricted to a specific plant or type of plant, it is known as a selective herbicide. If its effectiveness covers a broad range of plants, it is considered to be non-selective herbicide.

I

incompatible uses

Land uses which cannot exist together by reason of either competition for limited resources or use by-products which prevent the alternative use. For example, timber harvesting and wilderness preservation are incompatible uses for one piece of land.

indicator species

A particular species of plant or animal whose presence in a certain situation or location is a fairly certain sign or symptom that particular environmental conditions are also present (management indicator species).

indirect effect (secondary effect)

A condition caused by an action or inaction through intermediary causal agents. An effect for which the causal linkages to the action or inaction are not readily apparent. Indirect effect contrasts with direct effect. This is not a measure of importance, but merely a classification by causal linkages. Direct effects are usually easier to detect and measure with certainty, but they may be either more or less important than indirect effects.

induced fish and wildlife outputs

Measurements of work accomplished by other resource functions to the benefit of fish and wildlife.

input-output analysis (interindustry analysis, Leontief analysis)

A quantitative study of the interdependence of a group of activities based on the relationship between inputs and outputs of the activities. The basic tool of analysis is a square input-output table, interaction model, for a given period that shows simultaneously for each activity the value of inputs and outputs, as well as the value of transactions within each activity itself. It has been especially applied to the economy and the industries into which the economy can be divided.

inner gorge

A stream reach bounded by steep valley walls which terminate up a more gentle topography. Common in areas of rapid stream dow or uplift, such as Northern California and Southwest Oregon. Walls must be 65 percent slope or greater.

inputs

Land, labor, and capital required to produce outputs. Inputs are generally represented by activity costs.

integrated pest management (IPM)

A process for selecting strategies to regulate forest pests in which all aspects of a pest-host system are studied and weighed. The information considered in selecting appropriate strategies includes the impact of the unregulated pest population on various resource values, alternative regulatory tactics and strategies, and benefit/cost estimates for these alternative strategies. Regulatory strategies are based on sound silvicultural practices and ecology of the pest-host system and consist of a combination of tactics such as timber stand improvement plus selective use of pesticides. A basic principle in the choice of strategy is that it be ecologically compatible or acceptable.

interdisciplinary (ID) team

A group of individuals with different skills and training assembled as a team to solve a problem or perform a task (assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve a problem). Members of the team proceed to a solution with frequent interaction so that each discipline may provide insights to any stage of the problem and disciplines may combine to provide new solutions. Thus it differs from a multidisciplinary team where each specialist is assigned a portion of the problem and their partial solutions are linked together to provide the final solution.

interim artificial propagation (IAP)

Augmentation of existing fish stocks on mainstem watercourses and/or their tributaries using aquacultural methods on a well-defined time-limited basis emphasizing use of natural and/or wild stock fish. IAP is an element of bioenhancement. Natural stock: progeny of natural self-reproducing anadromous salmonids regardless of ancestry. Wild stock: natural self-reproducing stocks that have not been supplemented or augmented with artificially produced fish.

intermittent stream

A stream or reach of a stream that flows only at certain times of the year, as when it receives water from springs or from some surface source. A stream which, in general, flows only during wet periods and is dry during dry periods.

irreversible/irretrievable effects

Any effect of an action or inaction which (due to physical, biological, or socioeconomic constraints) cannot be recovered (by returning the object of the effect to its previous condition) within a reasonable length of time.

issue

A matter that is in dispute between two or more parties; a point of debate or controversy.

L

Land and Water Conservation Fund Act (78 Stat. 897, as amended; 16 U.S.C. 4601-4 to 4601-11, 23 U.S.C. 120 [Note]).

Provides funds for the Federal acquisition and development of outdoor recreation resources.

landform

Term used to describe many types of land surfaces which exist as a result of geological activity, such as a plateau, plain, basin, mountain, etc.

limits of acceptable change (LAC)

A planning process that consists of the following four main components: (1) the specification of acceptable and achievable resource and social conditions, defined by a series of measurable indicators; (2) an analysis of the relationship between existing conditions and those judged acceptable; (3) identification of management actions necessary to achieve these conditions; and (4) a program of monitoring and evaluation of management effectiveness.

linear programming

A mathematical method used to determine the most effective allocation of limited resources between competing demands when both the objective (e.g., profit or cost) and the restrictions on its attainment are expressible as a system of linear equalities or inequalities (e.g., $y = a + bx$).

local road

See "road".

long-term sustained yield (LTSY)

The highest uniform wood yield from lands being managed for timber production that may be sustained under a specified management intensity consistent with multiple-use objectives.

M

macroinvertebrates

These are components of the aquatic environment that provide a connecting link in the food chain between multicelled periphyton, detritus from terrestrial sources and the fish population. They are essential as a food source because of their strict habitat requirements and are very useful as indicators of changes in aquatic habitat. The number, size and species of aquatic invertebrates are important to fish habitat as they are the primary food source for many trout and young salmon. Aquatic invertebrates include insects such as mayflies and stoneflies, crustaceans such as crayfish and shrimp, molluscs such as snails and clams, and fresh water earthworms. Terrestrial invertebrates are also an important food source.

major disturbance

See "visual condition".

management area

A contiguous area of land used in planning, usually consisting of differing analysis areas, to which one or more prescriptions are applied. Management areas do not vary between alternatives; however, the prescriptions applied to them do vary.

management direction

A statement of goals and objectives and the associated management prescriptions and standards and guidelines for attaining them.

management indicator assemblages

Groups of wildlife associated with vegetative communities or key habitat components that are used to monitor effects of management activities.

management indicator species (MIS)

See "indicator species".

management intensity

The level of output or use to be obtained on a given land area.

management practice

A specific activity, measure, course of action or treatment.

management prescription

Management practices and intensity selected and scheduled for application on a specific area to attain goals and objectives.

market

The processes of exchanging a good or service for money or other goods or services according to a customary procedure. A market need not be an established institution located at a specific place.

market area

The area from which a market draws or to which it distributes its goods or services, and for which the same general prices and price influences prevail.

mass wasting

A general term for the dislodgement and downslope transport of soil and rock material under the direct application of gravity. Mass wasting includes slow displacement such as creep, and rapid displacement such as rockfalls, landslides and debris torrents.

mast

Nuts, acorns, and similar products of hardwood species, which are consumed by animals.

maximum modification

See "visual quality objective (VQO)".

middleground (middle distance)

The portions of a view between 1/4 or 1/2 mile and three to five miles from the observer. The "middleground" portions of a view are especially critical because they tend to dominate the view. It is in this distance range that the emergence of shapes and patterns on the landscape can be clearly seen. Consequently, the "middleground" portions of a view often best show whether manmade changes rest easily or uneasily on the landscape.

millennia

A period of 1,000 years.

mineral entry, withdrawals

The exclusion of mining locations and mineral development work on areas required for administrative sites by the Forest Service and other areas highly valued by the public.

minimal timber management

See timber management intensities.

minimum implementation requirements (MIRs)

Requirements which are within agency control but at the forest level there is little discretionary control regarding the application of them on the ground. They are needed to ensure that alternatives are minimally acceptable and implementable on the ground.

minimum management requirements (MMRs)

Requirements which are outside of Forest Service authority to change (i.e., statutes and regulations in contrast to manual direction or agency policy).

minor disturbance

See "visual condition".

modification

See "visual quality objective (VQO)".

monoculture

The cultivation of a single timber species excluding others.

multi-disciplinary Team

A joint effort by two or more people having different scientific training and/or backgrounds and assigned responsibilities in the same activity or effort. Each specialist is assigned a portion of the problem and their individual solutions are combined to provide the complete solution.

multiple use

The management of all the various renewable surface resources of the National Forest so that they are utilized in the combination that will best meet the needs of all.

mustelid

A family of small active carnivorous mammals including many important furbearers and predators such as the mink and fisher.

N

National Environmental Policy Act of 1969 (NEPA)

An Act of Congress which declared a National policy to encourage productive and enjoyable harmony and protection of the environment.

National Forest Management Act of 1976 (NFMA)

Act of Congress that amended the Forest and Rangeland Renewable Resources Planning Act of 1974, to require and direct, among other things, the preparation of forest plans.

National Forest system

The National Forest system consists of units of Federally owned forest, range, and related lands throughout the United States and its territories, united into a nationally significant system dedicated to the long-term benefit for present and future generations. The National Forest system includes all National Forest system lands reserved or withdrawn from the public domain of the United States, all National Forest system lands acquired through purchase, exchange, donation, or other means, the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012), and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as a part of the system.

natural diversity data base

The State's data base of recorded locations for important plant and animal species.

natural openings

A natural (non-human-caused or induced) break in forest canopy with an understory predominately made up of herbacious cover(grasses/forbs).

net public benefits (NPBs)

An expression used to signify the overall long-term value to the nation of all outputs and positive effects (benefits) less all associated inputs and negative effects (costs) whether they can be quantitatively valued or not. NPBs are measured by both quantitative and qualitative criteria rather than a single measure or index. The maximization of NPBs to be derived from management of units of the National Forest System is consistent with the principles of multiple use and sustained yield.

neotropical migratory birds

Birds that breed in North America and migrate to Central or South America during fall and winter. Population levels of these birds are of international concern.

nepheld metric

Measure of suspended sediments in a water column (Fisheries term).

non-chargeable volume

All volume that is not included in the growth and yield projections for the selected management prescriptions used to arrive at the allowable sale quantity.

non-consumptive species

Wildlife species not "taken" for food, pelts, or sport, but normally, observed, studied, photographed, etc. (as opposed to harvest or consumptive species).

non-declining yield

Timber scheduled for harvest so that any given decade's production does not fall below the previous decade's production.

non-discretionary resources

Resources considered in the proposed Forest Plan where the choices of allocation are limited by law and/or regulation, or by unique, site-specific sets of physical - environmental requirements. Wilderness, Research Natural Areas, and Wild and Scenic Rivers are examples of non-discretionary allocations.

non-market outputs

Forest outputs not normally exchanged in markets. In the Forest Service, the following are classified as nonmarket outputs: dispersed recreation, fish and wildlife user days, and water. Although not normally exchanged in markets, the Forest Service assigns proxy values for analysis purposes.

non-point source

Source is general rather than specific in location.

O

objective

A concise time-specific statement of measurable planned results that responds to pre-established goals. It forms the basis for further planning to define the precise steps to be taken and resources to be used in achieving identified goals.

obliterate (roads)

Obliterate means to block a road's use as a transportation facility, remove any drainage structures, and return the land it occupies to full production.

off-highway vehicle (OHV)

Off-road vehicle; examples include 4-wheel drives, jeeps, motorcycles.

older over-mature habitat

Multi-layered large older overmature tree stage generally with an average age of the dominant trees of over 180 years. These stands display obvious signs of decadence and contain at least three trees per acre (standing or down) (on the average) over 36 inches dbh. Referred to as old-growth habitat, or late

old-growth

See "older over-mature habitat".

opportunity cost

The value of benefits foregone or given up due to the effect of choosing another management alternative that either impacts existing outputs or shifts resources away from other activities so that they are no longer produced and their benefits are lost.

output

Goods, products, or services that are purchased, consumed, or utilized by people.

output, maintenance level

The amount of an output which will occur regardless of management activity.

overstory

That portion of the trees in a forest, with more than one roughly horizontal layer of foliage, which forms the upper or uppermost layer.

overstory removal

A timber cutting method applied to stands with two distinct age or size classes, the older (or larger) of which is merchantable and is removed. The removal should leave an adequately stocked stand of understory trees.

P

partial retention

See "visual quality objective (VQO)".

perennial stream

A stream or reach of a stream that flows continuously throughout the year and whose upper surface generally stands lower than the water table in the region adjoining the stream.

people-at-one-time (PAOT)

A public recreational usage measurement term. The number of people in an area or using a facility at the same time. Generally used as "maximum PAOT" to indicate capacity of an area or facility to support peak usage loads.

pest

An organism, plant or animal, which interferes with the attainment of the Forests' goals and objectives.

pesticide

Any material, synthetic or natural, used to control populations of pests.

pH

A measure of hydrogen-ion activity in solution expressed on a scale 0 (highly acid) to 14 (highly basic); 7.0 pH is a neutral solution, neither acid nor basic (Fetgh, 1973).

planned ignition

A fire started by deliberate management action.

planning area

The area of the National Forest system covered by a Forest Plan.

planning horizon

The overall time period considered in the planning process that spans all activities covered in the analysis or plan and all future conditions and effects of proposed actions which would influence the planning decisions (end of 16th decade/160 years from current).

policy

A specific decision or set of decisions together with related actions designed for implementation.

porosity

Porous; capable of absorbing moisture.

prescribed burn

Intentional application of fire to wildland fuels in either their natural or modified state, under such conditions of weather, fuel moisture, soil moisture, etc. as allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further ascertain planned objectives of silviculture, wildlife habitat, grazing, fire-hazard reduction, etc. It seeks to employ fire scientifically so as to realize maximum net benefits with minimum damage at acceptable costs.

present net value (PNV)

The difference between the discounted value (benefits) of all outputs to which monetary values or established market prices are assigned and the total discounted costs of managing the planning area.

preservation

See "visual quality objective (VQO)".

price-quantity relationship

A schedule of prices that would prevail in a market for various quantities of the good or service exchanged.

primitive recreation

See "recreation opportunity spectrum (ROS)".

program

The renewable resources program required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA).

project

A work schedule prescribed for a project area to accomplish management prescriptions, investments, maintenance, or protection.

project planning (operation planning)

Types of planning concerned with physical undertakings (such as a dam). Project planning incorporates a greater range of specific elements than functional planning, and thus, deals with more numerous and diverse parts.

proxy value

A value assigned to a good or service for evaluation purposes when the good or service is not bought or sold and an established monetary price does not exist.

public issue

A subject or question of widespread public interest relating to management of the National Forest system.

public participation activities

Meetings, conferences, seminars, workshops, tours, written comments, survey questionnaires, and similar activities designed or held to obtain comments from the general public and specific publics about National Forest system land management planning.

pyroclastic

A clastic rock material formed by volcanic explosion or aerial expulsion from a volcanic vent.

R

range allotment

An area designated for the use of a prescribed number and kind of livestock.

range, primary

Areas which livestock prefer to graze and overuse will occur before livestock select a secondary range.

range, secondary

Range which is lightly used or unused by livestock and will ordinarily not be significantly used until overuse of the primary range.

range, transitory

Land temporarily suitable for grazing . For example, grass may cover the area before being replaced by growth not suitable for forage, such as forested vegetation.

rate-of-return

Rate of interest at which the net discounted benefits equal the net discounted costs. (Internal rate-of-return is a similar measure appropriate to private firms.)

real dollar value

A monetary value which compensates the effects of inflation.

receipt shares

The portion of receipts derived from Forest Service resource management activities distributed to State and County governments, such as the Forest Service 25 percent fund payments.

recreation opportunity spectrum (ROS)

A means of classifying and managing recreation opportunities based on physical setting, social setting, and managerial setting. Criteria results in five different ROS Classes briefly described below:

Primitive (P) - An area 3 miles or more from roads and trails with motorized use, generally 5,000 acres or greater in size in essentially an unmodified natural environmental setting.

Semi-primitive Non-motorized (SPNM) - An area 1/2 mile from roads and trails with motorized use. Generally 2,500 to 5,000 acres unless contiguous to primitive areas or wildernesses with subtle modifications to an otherwise natural setting.

Semi-primitive Motorized (SPM) - An area 1/2 mile from roads and trails with motorized use and generally 2,500 to 5,000 acres in size. May have moderately dominant alterations to an essentially natural setting with motorized use of roads and trails.

Roaded Natural (RN) - An area 1/2 mile or less from roads and trails and open to motorized use.

Resource modifications and utilization practices are evident but harmonize with the natural environment.

Rural (R) - The natural environment is substantially modified to the point that developments are dominant to the sensitive travel route observer. Structures are readily evident and may range from scattered to small dominant clusters. Pedestrian or other slow moving observers are constantly within view of culturally changed landscapes. Visitor contact is moderate to high. Controls and regulations are obvious and law enforcement is visible. Typical activities or facilities include but are not limited to camping, fishing, information centers, convenience stores, resorts, marinas, and downhill ski areas.

recreation theme area

A conceptual organization of the recreation potential into geographic areas to provide a framework for examining recreational management opportunities. A list of recreation opportunities for each of the 12 theme areas appears in the Draft EIS, Chapter III, "Recreation" section.

The 12 recreation theme areas are:

1. Rural Community Interface
2. Trinity Divide and Castle Crags
3. Mt. Shasta Recreation Area and Wilderness
4. McCloud River (upper, reservoir, lower)
5. Medicine Lake Highlands
6. Main Fork Trinity River
7. Trinity Alps Wilderness
8. Yolla Bolly and Chanchelulla Wildernesses/Tedoc Mountain
9. South Fork Trinity River/Chinquapin
10. Shasta Unit of the National Recreation Area (NRA)
11. Trinity Unit of the NRA
12. Scenic Byways

recreation visitor day

Defined as one person on site for a 12 hour period or any combination of people - i.e., 3 people on site for four hours each).

recreational river area

Wild and Scenic Rivers Act usage. Those rivers or sections of rivers that are readily accessible by road or railroads, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

reforestation backlog

Suitable timber land which is currently not stocked with commercial trees species. Lands occupied mainly with hardwoods, brush, or grasses scheduled for conversion to commercial conifers through reforestation.

regeneration cutting

Applies generally to the logging stands of rotation age or greater, and of stands below rotation age which cannot economically be held any longer because of poor stocking, health, thrift, quality, or composition. These cuttings are intended to replace the existing stands with a new stand.

Research Natural Area (RNA)

An area established specifically to preserve a representative sample of an ecological community; primarily for scientific and educational purposes.

reserve tree

Any tree or group of trees left unfelled in a harvest area that is being regenerated and kept as part of the new stand.

Resource Allocation Model Preparation (RAMPREP)

Pacific Southwest Region (Region 5) computer program for projecting timber growth and yields from existing and regenerated stands.

Resource amenity emphasis category

Individuals in this social category typically value natural resources more for their amenity and symbolic values than their economic conversion values. For example, these individuals would prefer that local natural resource commodity items, such as timber, not be harvested but be retained for future generations. See the proposed Forest Plan, Chapter 3, for more information on this category.

Resource utilization emphasis category

Individuals in this social category typically are directly or indirectly associated with the utilization/marketing of the natural resources in the impact area. An example is those individuals whose occupations and/or political activities are associated with the wood products industry. See the proposed Forest Plan, Chapter 3, for more information on this category.

responsible line officer

The Forest Service employee who has the authority to select and/or carry out a specific planning action.

retention

See "visual quality objective (VQO)".

riparian area

Areas consisting of riparian ecosystems, aquatic ecosystems, or wetlands. Referring to the land bordering a stream, lake, marsh, or wet meadow.

rip-rap

Wall or foundation of stones placed together, e.g. for stream bank protection.

rip-rap composition

Using large rocks, boulders, concrete chunks or similar non-erosive objects as an armoring device for soil stability.

risk cutting

Cutting to remove trees that are likely to die before the next periodic cut.

road

Transportation route for motorized vehicles wider than 40 inches. The three types of National Forest roads are arterial, collector, and local.

Forest arterial road. Serves large areas and usually connects with public highways or other Forest arterial roads to form an integrated network of primary travel routes. Usually paved or chip sealed. Travel speed: 25 mph or greater. Developed and operated for long-term management purposes and constant service.

Forest collector road. Serves smaller areas than arterial roads. Collects traffic from Forest local roads and/or terminal facilities and is usually connected to a Forest arterial or public highway. Typically has an aggregate, aggregate and oil, or chip seal surface. Travel speed: 15-25 mph. Road length: 5-15 miles. Operated for constant or intermittent service depending on management objectives for the area.

Forest local road. Connects terminal facilities with Forest collector, arterial roads, or public highways. Road may or may not have an aggregate surface. Travel speed: 5 mph. Road length: less than 5 miles, developed and operated for long or short term service; may be closed.

road maintenance levels

The distinction between maintenance levels is not always sharply defined. Some criteria may overlap two or more different maintenance levels. Assignment at specific maintenance levels should be based on the criteria that best fits the management objectives for the road. Some road management objectives, such as for interior campground road, may not be compatible with some of the following criteria. In these situations, the desired level of user comfort and convenience should be used as the overriding criteria to determine the maintenance level.

Level 1 - Intermittent service roads during the time management direction requires that the road be closed or blocked to traffic. Basic custodial maintenance is performed to protect the road investment and to keep damage to adjacent resources to an acceptable level. Drainage facilities and runoff patterns are maintained.

Level 2 - This level is assigned where management direction requires that the road be open for limited passage of traffic. Traffic is normally minor, usually consisting of one, or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Roads in this maintenance level are normally characterized as single lane, primitive type facilities intended for use by high clearance vehicles. Passenger car traffic is excluded.

Level 3 - This level is assigned where management direction requires the road to be open and maintained for safe travel by a prudent driver in a passenger car. Traffic volumes are minor to moderate. Roads are normally characterized as low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. The functional classification of these roads is normally local or minor collector.

Level 4 - This level is assigned where management direction requires the road to provide a moderate degree of user comfort and convenience at moderate travel speeds. Traffic volumes are normally sufficient to require a double lane aggregate surfaced road. Some roads may be single lane and some may be paved and/or dust abated. The functional classification of these roads is normally collector or minor arterial.

Level 5 - This level is assigned where management direction requires the road to provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. Functional classification of these roads is normally arterial.

roaded natural recreation

See "recreation opportunity spectrum (ROS)".

rotation

The period of time between the initial timber stand establishment and the time when it is considered ready for cutting and regeneration.

rural recreation

See "recreation opportunity spectrum (ROS)".

S

salvage cutting

Cutting primarily to utilize dead and downed material and scattered trees considered non-merchantable if left in the stand until the next scheduled cut.

sanitation cutting

The removal of dead, diseased, infested, damaged, or susceptible trees essentially to prevent the spread of pests or pathogens and so promote forest hygiene.

scenario

An outline or synopsis of a fixed sequence of future events in a defined environment.

scenic river

Wild and Scenic Rivers Act usage. Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

selection logging (selection cutting)

Cutting method in which individual trees or small groups of trees are removed to create a stand with different sizes and age classes on the same site. This results in an uneven-aged stand.

semi-primitive motorized recreation

See "recreation opportunity spectrum (ROS)".

semi-primitive non-motorized recreation

See "recreation opportunity spectrum (ROS)".

sensitive species

Species which have appeared in the Federal Register as proposed additions to the endangered or threatened species list; those which are on an official state list or are recognized by the Regional Forester to need special management in order to prevent them from becoming endangered or threatened.

sensitivity level

A particular degree or measure of viewer interest in the scenic qualities of the landscape.

seral

A biotic community which is a developmental, transitory stage in an ecologic succession.

seral stage

A stage or category that represents an ecologic successional time period. For example, an old-growth forest is a late seral stage.

shelterwood system

Even-aged silvicultural systems in which (in order to provide a source of seed and/or protection for regeneration) the old crop is removed in two or more successive "shelterwood cuttings," the first of which is ordinarily the seed tree cutting and the last is the final overstory removal cutting.

silviculture

Generally, the science and art of cultivating (i.e., growing and tending) forest crops.

silvicultural system

Establishing, growing and tending of forests. Systems are classified as even or uneven-aged according to the method of carrying out harvesting (extraction of timber).

site index

A numerical evaluation of the quality of land for plant productivity, especially used in forest land where it is determined by the rate of growth in height on one or more of the tree species.

skiers-at-one-time (SAOT)

A public recreational usage measurement term. The number of skiers in an area or using a facility at the same time. Generally used as "maximum SAOT" to indicate capacity of an area or facility to support peak usage loads.

slope gradient

Amount of elevation change per 100 feet, usually expressed as a percentage.

snag

A standing dead tree from which the leaves and most of the branches have fallen. Snags are important for wildlife, especially for cavity nesters such as woodpeckers and wood ducks.

special interest area (SIA)

Areas established and managed for their unique special feature. They include geological, historical, archaeological, botanical, and other memorable features.

social categories

Individuals and groups of individuals are affected differently by Forest management activities primarily

because of different social linkages to the Forest. Social categories have been formed based on historical and projected trends of user groups, public hearings, informal interviews of Forest personnel and users, and other government studies and documents, use surveys and census data. In the proposed Forest Plan, Chapter 3, social categories are used to describe the various linkages and effects of management activities. These categories are: (1) recreationists; (2) Native Americans; (3) resource amenity emphasis; and (4) resource utilization emphasis. Resource amenity emphasis and resource utilization emphasis categories are further defined in this glossary.

species assemblages

A collection of species sharing a common habitat or situation.

spotted owl habitat area (SOHA)

Refer to habitat conservation area (HCA)

stand

A community of trees occupying a specific area sufficiently uniform in composition, age arrangement and condition distinguishable as a silvicultural or management unit. Typically, stand sizes vary from about 5 to over 30 acres on National Forest System lands.

stand maintenance

A management practice which includes individual tree harvest by salvage and high-risk sanitation for the removal of fire-killed, insect infested, and dead trees, although other live trees may be cut in the process.

standard and guideline

A principle requiring a specific level of attainment, a rule to measure against. It provides basic direction for implementation of management activities.

standard service level

Management of recreation facilities which provides for vegetation management, full maintenance of facilities, appropriate toilet cleaning and garbage pick up, and information and interpretive services for the recreation user.

stocking level

In a forest, a more or less subjective indication of the number of existing trees as compared to the desirable number for best results - e.g., maximum productivity of wood.

strategy

A consideration of alternative means to reach an objective.

sub-climax plant community

A successional stage of a vegetative type that is prior to the final stage.

succession

The process of replacement of one plant community (age, composition, height and density) over time by another until the final (climax) or stable biotic community is reached.

successional climax

See "succession".

successional stage

See "succession".

suitable forest land

Land that is to be managed for timber production on a regulated basis in an alternative.

sump

A depression at the lowest level to receive water and form a pool,allowing particulate matter to settle.

sustained yield

A continuous supply or yield over time.

synergistic

Cooperative or combined action between people or agencies so that the total effect is greater than the sum of the parts.

T

target

A statement used to express planned results to be reached within a stated time period.

terracing

A treatment used to prepare steep slopes (20 to 60 percent) for reforestation. Tractors are used to cut terraces (benches) along the contour of the slope to remove competing vegetation and/or expose mineral soil. Terraces are normally 8 to 12 feet wide with an undisturbed area left between the terraces. One to two rows of trees, spaced 6 to 10 feet apart, are then planted on each terrace.

theoretical maximum capacity (TMC)

Formula used for planning purposes that captures a percentage of the design capacity* of a recreation facility.

TMC = PAOT x managed season days x 2 x 40%

Where PAOT = people-at-one-time

Managed season days = number of days that a facility is open for use

2 = two 12 hour recreation visitor days/use days

40% = estimated percent of time the site is utilized by a visitor in a 24 hour period

* Design capacity. The number of PAOT which the space or facility can safely and conveniently support, consistent with the level of recreation experience (degree of site development) the site is intended to provide.

thermal cover

Trees of sufficient density that provide shelter from adverse temperature conditions for wildlife.

thinning

Cutting made in an immature crop or stand in order primarily to maintain or accelerate the diameter increment (annual growth) of the residual trees but also, by suitable selection, to improve the average form of the trees that remain, without permanently breaking the canopy.

threatened, endangered, and sensitive species

See separate listing for each.

threatened species

Any species which is likely to become an endangered species within the forseeable future and which has been designated as threatened in the Federal Register.

threshold of concern (TOC)

The point which a physiological or psychological effect begins.

threshold level

The minimum concentration or amount of a given substance or condition necessary to produce a measurable physiological or psychological effect.

timber harvest schedule

The quantity of timber planned for sale and harvest, by time period, from the area of land covered by a Forest Plan. The first period, usually a decade, of the selected harvest schedule provides the allowable sale quantity. Future periods are shown to establish that sustained yield will be achieved and maintained.

timber management intensities

Intensive. A category of timber management intensity characterized by optimum timber yields (80-100 percent of potential) using the full range of silvicultural practices and intensities to obtain these yields. Average rotation lengths vary from 100 to 110 years. Other non-timber objectives do not substantially constrain timber outputs. Examples of land included in this category are Timber Management (Prescription VIII).

Minimal. A category of timber management intensity characterized by minor yields (20 percent of potential), primarily from sanitation/salvage cutting, due to site limitations or resource objectives which severely restrict timber management. Average rotation length is 200 years.

Modified. A category of timber management intensity characterized by reduced yields (70 to 80 percent of potential) due to limitations on silvicultural practices or intensities in order to meet other resource objectives. Average rotation length is 125 years. Examples of land included in this category are Wildlife Habitat Management (Prescription VI) and visual partial retention areas of Roaded Recreation (Prescription III).

timber production

The purposeful growing, tending, harvesting, and regeneration of regulated crops of trees to be cut into logs, bolts or other round sections for industrial or consumer use. The term does not include firewood.

timber stand improvement (TSI)

The use of pre-commercial thinning, cleaning, weeding and intermediate cuttings to eliminate or suppress less desirable vegetation and improve composition, condition, structure, or growth of a stand.

timber suitability

Suitable. Forest land that is to be managed for timber production on a regulated basis in an alternative.

Tentatively Suitable. Forest land that: (1) is producing or is capable of producing crops of industrial wood; (2) has not been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; (3) has existing technology and knowledge to ensure timber production without irreversible damage to soils, productivity, or watershed conditions; (4) has existing technology to ensure adequate restocking can be attained within 5 years after final harvest; and (5) has adequate information available

to project responses to timber management activities.

Unsuitable (Not Suited). Forest land that is not managed for timber production because (1) the land has been withdrawn by Congress, the Secretary of Agriculture, or the Chief of the Forest Service; (2) the land is not producing or capable of producing crops of industrial wood; (3) technology is not available to prevent irreversible damage to soils, productivity, or watershed conditions; (4) there is no reasonable assurance that lands can be adequately restocked within 5 years after final harvest, based on existing technology and knowledge, as reflected in current research and experience; (5) there is at present a lack of adequate information in response to timber management activities; or (6) timber management is inconsistent with or not cost efficient in meeting the management requirements and multiple-use objectives specified in the proposed Forest Plan.

tradeoff

The impact on an output or cost produced by changing another output or cost.

transportation network

The transportation network includes all existing and planned roads, trails, bridges, airfields, and other transport facilities wholly or partly within or adjacent to and serving the planning area.

travel influence zone

Areas comprising existing or anticipated significant public outdoor recreational occupancy use along existing and planned overland routes of travel; areas in and around existing or planned developed recreation sites. These are areas in which beauty of the landscape and other aesthetic values are key management considerations.

Trinity Divide Biolink

A link for biologic elements (animals, plants and people) joining the Klamath and South Cascade physiographic provinces.

type conversion

The conversion of one type of vegetation cover to another, e.g., the conversion of brush or forest covered lands to grass as for grazing purposes.

U

unacceptable modification

Activities that contrast excessively in form, line, color or texture from the characteristic landscape.

underburning

The prescribed use of fire beneath a forest canopy.

understory

The lower layer of trees and shrubs under the forest canopy.

uneven-aged timber management

A timber management practice in which the application of a combination of actions needed to maintain continuous high-forest cover, recurring regeneration of desirable species, and the growth and development of trees through a range of diameter or age classes, provides a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of sizes classes. Cutting methods that develop and maintain uneven-aged stands are single-tree selection and group selection. See also Appendix L in the proposed Forest Plan for definition.

unnoticed

See "visual condition".

unplanned ignition

A fire started at random by either natural or human causes, or a deliberate incendiary fire.

untouched

See "visual condition".

V

values-at-risk

Any resources that are at risk of being damaged/destroyed as a result of fire.

values, market

Values for market goods and services in terms of what people are willing-to-pay as evidenced by market transactions - measured in real dollars.

values, non-market

Values for non-market goods and services that must be inputed from other economic information.

variety class

A classification system with three landscape categories:

Distinctive (Class A). Unusual and/or outstanding landscape variety that stands out from the common features in the landscape.

Common (Class B). Prevalent, usual, or widespread landscape variety within a character type. It also refers to ordinary or undistinguished visual variety.

Minimal (Class C). Little or no visual variety in the landscape; monotonous or below average compared to the common features in the character type.

vegetative pattern

A vegetative arrangement of parts, elements, or details that suggests a design of somewhat orderly distribution.

viewshed

Landscape seen or potentially seen from all or a logical part of a travel route, use area, or water body. The purpose of corridor viewshed planning is to provide the management direction for retaining or creating the desired forest character in an attractive sequential arrangement over time and space.

visual absorption capability (VAC)

Capacity of a landscape to absorb proposed development or management activities and still maintain its inherent visual character and quality. Two of the most important factors affecting the absorption capability of a landscape are: (1) the degree of visual penetration, i.e., the distance into the landscape you can see from a vantage point, and (2) the complexity of the landscape.

visual character

The overall impression created by a landscape's unique combination of visual features (such as land, vegetation, water, structures, etc.).

visual condition

The degree of physical alteration to the landscape. Visual condition is referred to as existing visual condition (EVC) or future visual condition (FVC). Visual condition of activities is measured by size, shape, and contrast in vegetative density. For example, an irregularly shaped management activity located in a densely canopied conifer stand which has removed most vegetation in a one to five acre area would be classified as visual condition class II.

This method of measurement is used to characterize the present quantity and degree of physical alteration, future quantity and degree of physical alteration, and the rate of change in those conditions that will occur over time in any alternative form of management.

Visual Condition Classes are as follows:

Class I - Untouched. Areas that appear to have no physical alteration.

Class II - Unnoticed. Areas can be any size with low contrast or very small (0-5 acres) with high contrast.

Class III - Minor disturbances. Areas over 40 acres with moderate contrast to very small areas (0-5 acres) with very high contrast.

Class IV - Disturbed. Very large areas (40+ acres) of high contrast to small areas (5-10 acres) of very high contrast.

Class V - Major disturbance. Very large areas of very high contrast to large (20-40 acres) areas of high contrast.

Class VI - Drastic disturbance. Areas greater than 300 acres of high contrast.

visual quality index (VQI)

A numerical rating of scenic quality; an indicator of the relative overall visual quality of the forests. Each acre of land is assigned a point value (ranking) based upon the visual quality level and the landscape variety class. Rankings range from a high of ten points for an acre of land managed to a preservation standard on variety class A lands, to no points for unacceptable modification on variety class C lands. Specific methodology for determining VQIs can be found in the Forest Planning Records.

visual quality objective (VQO)

A set of measurable maximum levels of apparent naturalness of an area based on physical and sociological characteristics. Refers to degree of acceptable alteration of a characteristic landscape.

Preservation. Ecological change only.

Retention. Human activities are not evident to the casual forest visitor.

Partial Retention. Human activity may be evident but must remain subordinate to the characteristic landscape.

Modification. Human activity may dominate the characteristic landscape but must, at the same time, follow naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Maximum Modification. Human activity may dominate the characteristic landscape but should appear as a natural occurrence when viewed as background.

W

warmwater fishery

Stream and lake waters which support fish with a maximum summer water temperature tolerance of about 80 degrees Fahrenheit. Bluegills, perch, and largemouth bass are examples.

watchable wildlife

Wildlife that people enjoy viewing such as deer and bald eagles.

waterform

The shape or visual structure of a body of water.

water influence zone

Areas oriented to outdoor water recreation.

watershed condition class

A description of the health of a watershed, or portion of the watershed, in terms of the factors which affect the quality, quantity and discharge characteristics of surface and groundwater resources, and the capacity of a soil for producing a plant community or sequence of communities under a specified system of management. See Appendix H for detailed descriptions of Class 1, 2, and 3 watersheds. Briefly, they are:

Class 1. Watersheds which are generally in good to excellent condition.

Class 2. Watersheds which are generally in fair to good condition.

Class 3. Watersheds which are generally in poor to good condition.

watershed order

(first, second, third, fourth, or fifth watershed). Location of a watershed relative to its tributaries, corresponding to stream order.

wetlands

An area at least periodically wet or flooded; where the water table stands at or above the land surface (wet meadows and marshes).

wilderness attribute rating system (WARS)

An index of wilderness quality used in the second Roadless Area Review and Evaluation (RARE II) of 1977. The rating consists of four requisite attributes: (1) natural integrity, (2) apparent naturalness, (3) outstanding opportunities for solitude, and (4) primitive recreation opportunities. In addition, the system provides for rating supplemental wilderness attributes: outstanding ecological, geological, scenic, and historical features.

wildlife user day (WUD)

A WUD represents a person being involved in the pursuit, taking or enjoyment of wildlife for a period of 12 hours.

wildlife habitat relationship (WHR)

A system for organizing information about wildlife, their habitats, and relationships between them, the land and resource management. It is used to set standards and guidelines, to evaluate species and habitat diversity, and to identify special habitat needs, etc.

wild river

Wild and Scenic Rivers Act usage. Those rivers or sections of rivers that are free of impoundments, with shorelines essentially primitive, generally inaccessible except by trail, and with unpolluted water.

X

xeric

Habitat characterized by dry conditions rather than mesic (moderate) or hygric (wet) conditions. Chaparral is an example.

APPENDIX A

Issues, Concerns, and Opportunities

APPENDIX A
Issues, Concerns, and Opportunities

Identification Process

Scoping Process (Identifying Public Issues)

In October 1979, the Forest Supervisor of the Shasta-Trinity National Forests initiated a public participation plan for the Forests' long-range planning process. Public participation for the Proposed Forest Land and Resource Management Plan (proposed Forest Plan) began with the publication of a Notice of Intent in the Federal Register on October 25, 1979.

On November 1, 1979, County Boards of Supervisors, the State Clearing House, and tribal leaders of local Native Americans were notified by letter about the Forests' planning process and the schedule of anticipated planning actions. At the same time, a news release was sent to newspapers and radio and television stations within the Forests' zone of influence.

A contact plan, identifying government officials and Native American tribal leaders affected by the Shasta-Trinity National Forests' planning process, was also prepared. In the contact plan, District Rangers and interdisciplinary team members were assigned responsibilities to brief their designated contacts, on a one-to-one basis, and to encourage their participation in the planning process. This contact plan is included in the planning records at the Forest Supervisor's Office, 2400 Washington Avenue, Redding, CA.

A preliminary mailing list was developed from previous public involvement efforts. This list, computerized for easy updating, contained the names and addresses of individuals, organizations, government agencies and Native American tribal leaders. It now contains about 700 names.

An initial planning newsletter, describing the planning process and inviting public participation in the identification of issues, was sent to everyone on the mailing list in December, 1979. In addition, posters (with return postcards), encouraging public participation, were placed in offices and stores throughout the Forests' zone of influence.

Paid advertisements appeared in four local newspapers during November, 1979, announcing public workshops in Burney, Mt. Shasta, Redding, and Weaverville. The workshop in Burney was co-hosted by the Lassen National Forest, and the Weaverville Ranger District workshop was co-hosted with the Mendocino National Forest. On November 20, 1979, a news release was circulated to the news media inviting the public to attend the November/December workshops.

As a result of the Forests' initial public participation effort, 330 written responses, containing some 2,000 comments, were received.

Screening of Suggested Issues

The first step in analyzing the public responses was to sort and classify the comments. In this step, comments of a general nature were separated from "public issues." By definition, a public issue is a subject or question of widespread public interest relating to the management of National Forest lands.

Many of the public's general comments pertained to the Forest Service's land management process and various day-to-day operational matters, rather than controversies about specific resource and management plans.

The next step was to screen the public issues by applying the four criteria described below. This screening was necessary to ensure that the proposed Forest Plan focuses directly on major public issues which will determine future uses of Shasta-Trinity National Forests' land and resources. (It should be noted that the proposed Forest Plan does not focus on broad national economic or social concerns, day-to-day operational decisions, or on matters beyond the scope, responsibility, and authority of the Forest Supervisor.) Each proposed issue was screened against four criterion. If a "yes" could be answered to all the criterion-questions, it became a major public issue. If the answer to any one criterion was no, the issue was screened "out" and did not become a major public issue.

Screening Criterion No. 1: LONG-RANGE versus SHORT-RANGE. Does the proposed issue involve major, long-range, land-use planning decisions ("strategic" decisions), as distinguished from short-range "operational" activities and decisions?

Screening Criterion No. 2: PLANNING LEVEL. Can the proposed issue be addressed at the Forest "level" within the planning process prescribed in the Planning Regulations and Federal legislation such as the National Environmental Policy Act (NEPA) and the Forest and Rangeland Renewable Resources Planning Act of 1980 (RPA)?

Screening Criterion No. 3: AUTHORITY. Is the proposed issue within the Forests' scope of direct responsibilities and authorities?

Screening Criterion No. 4: PUBLIC INTEREST. Is the proposed public issue a subject or matter of widespread public interest, relating to the management of National Forest lands, identified through public participation?

Of the 111 issues which were screened, 25 met all of the criteria. Subsequently, they were addressed as "major public issues" in the 1986 Forest planning documents.

Screening of Management Concerns

National Forest Management Act (NFMA) regulations require that the Forest Supervisor determine the management concerns that are to be addressed in the planning process. Proposed management concerns were derived from the following sources:

1. References spread throughout the NFMA regulations which relate to specific resources, activities, and concerns.

2. Management concerns recommended by Forest personnel. Similar to the analysis of public issues, these items were sorted by applying the regulations' definition: "A management concern (is) an issue, problem, or condition which constrains management practices identified by the Forest Service in the Planning process." Following this sort, the proposed management concerns were screened against three criteria given in the Forest Service Manual (FSM 1920):

   a. Those that do not involve long-range planning and that are usually addressed at the project level (this corresponds to Screening Criterion #1 for major public issues).

   b. Those that cannot appropriately be addressed at the National Forest level (corresponds to Criterion #2 for major public issues).

   c. Those that do not involve the Forest Service (corresponds to Criterion #3 for major public issues).

Those items which were screened "in" were placed under the appropriate RPA program element to accompany major public issues as "related management concerns."

Public Issues/Management Concerns Document

In a letter dated May 23, 1980, everyone on the Forests' planning mailing list was notified which public issues were selected to be addressed in the proposed Forest Plan. The letter also referred to a detailed report of the issue/identification process that was available for review. Copies of this document are in the official planning records at the Forest Supervisor's Office, 2400 Washington Avenue, Redding, California.

The letter also announced that open houses would be held in June in Hayfork, Mt. Shasta, Redding, and Weaverville to answer questions about the proposed Forest Plan and the disposition of public comments. Very few people attended these open houses.

Information meetings were also held in Mt. Shasta, Redding, and Weaverville during December, 1980.

In 1983 an extensive public involvement effort was undertaken with regard to roadless areas. This process focused specifically on the roadless areas recommended for wilderness, non-wilderness, and further planning in the 1979 Roadless Area Review and Evaluation (RARE II) Environmental Impact Statement (EIS). A detailed description of this effort is on file in the official planning records at the headquarters of the Shasta-Trinity in Redding.

Since the Forest planning process began, a coordinated planning approach has taken place with local, State, and Federal agencies, National Forests in Northern California and Southern Oregon and the Regional Office in San Francisco.

A progress report on the status of the proposed Forest Plan has been displayed regularly in the semi-annual (April and November publication of the Forest Environment Assessment [EA] Status Report.) About 150 of these publications are sent to elected officials, government agencies, organizations and individuals.

Land Management Planning Documents (1986)

In August, 1986, the Shasta-Trinity National Forests issued two land management planning documents for public review and comment. Nearly 1,000 copies of the Proposed Forest Land and Resource Management Plan (proposed Forest Plan) and the Draft Environmental Impact Statement (Draft EIS) were sent to interested publics along with a transmittal letter. Another 400 documents were mailed upon request during the public review period. In addition, a news release was sent to the news

media within the Shasta-Trinity National Forests' zone of influence outlining the public review process and encouraging public participation.

The initial 90-day public review period began with the issuance of the proposed Forest Plan and Draft EIS on August 17, 1986. Public briefings were held between August 25th and September 4th in Burney, Hayfork, McCloud, Mt. Shasta, Red Bluff, Redding, and Weaverville.

Reaction to the documents was mixed. Some wanted the documents to be withdrawn and others asked that the public comment period be extended. Because of the implications of some of the concerns raised, Regional Forester Zane G. Smith announced on September 26, 1986, that the draft documents were being recalled and would be re-issued at a later date. However, he encouraged public comments by emphasizing that they would be extremely helpful in rewriting the proposed Forest Plan and Draft EIS. Shortly after Smith's announcement, the public review date was extended to January 17, 1987.

During December, 1987, eight (afternoon and evening) formal hearings were held at Redding (12/8), Hayfork (12/9), Weaverville (12/10), and Mt. Shasta (12/11). A total of 163 people gave statements at the hearings.

By the close of the public review period, the Shasta-Trinity National Forests had received more than 1,300 pieces of correspondence containing a wide variety of valuable information. Comments came in the form of postcards, letters, form letters, petitions, resolutions, and 100 page documents as in the case of a Citizen's for Better Forestry Alternative and a Wilderness Society Critique. Transcripts from the public hearings were analyzed the same as the other correspondence received.

A summary of the content analysis process (the method used to analyze the public comments received) was made available to the public in May, 1987.

Comments received during the 1986/87 public review period were used to update and revise the public issues for the 1990 phase of Forest planning. Management concerns were either dropped or elevated to public issues. Thirty major public issues were addressed in Chapter I of the 1990 Draft EIS. For a detailed list and description of those issues refer to that document.

Revision Of Land Management Planning Documents (1987-1990)

From the close of the public comment period (January, 1987) through the re-issuance of the revised planning documents, emphasis was placed on providing the public with a better understanding of some of the major areas of controversy. This was done primarily through a series of public seminars.

A March, 1987, seminar covered the content and capability of the new planning data base for the Forest. Also presented was information on the revised planning schedule and an overview of the public comments received on the Draft EIS and proposed Forest Plan. A seminar held in May, 1987, addressed the various silvicultural systems, including alternatives to clearcutting. A preliminary analysis of the amount of timber that could be produced by adopting any on the silvicultural systems was also presented.

At the July, 1987 seminar, spotted owls and some options for managing their habitat was discussed. A September, 1987 seminar covered how the management of the natural resources, employment, revenues, and Forest Service budgets fit together in the development of a Forest plan. An early Fall, 1988 seminar focused on the formation of alternative Forest plans.

Throughout the planning period, Forest Service personnel worked closely with individuals and groups to give them a better understanding of the forest planning process. Some of the groups included: The Audubon Society, Sierra Club, SHARE (Shasta Alliance for Resources and Environment), CBF (Citizens for Better Forestry), California Native Plant Society and The Wilderness Society.

The Citizens for Better Forestry developed and proposed an alternative Forest Plan in December of 1986. Representatives from CBF worked closely with Forest Service planners to refine their proposal so it could be evaluated along with other alternatives in the Draft EIS. The CBF proposal was displayed as Alternative CBF.

In addition, the Trinity County Board of Supervisors submitted comprehensive suggestions that applied to portions of Trinity County. Although those suggestions were not treated as a separate, new alternative, many of them were analyzed in detail and brought forward into one or more of the alternatives.

A few "round table" sessions, sponsored by the University of California Cooperative Extension Forester, were held in Mt. Shasta and Weaverville. The purposes of those sessions were to provide a public forum to share ideas and gain a better understanding of the Forests' planning process.

Since the decision was made to revise and re-issue the documents, informational programs were also presented to various groups such as Shasta County School Administrators, Rotary Clubs, American Society of Civil Engineers, Miner's Committee, California Registered Professional Foresters and The Shasta Fly Fishers.

Land Management Planning Documents (1990)

On February 27, 1990, the Shasta-Trinity National Forests issued a Draft EIS and proposed Forest Plan for a 120-day period of public review and comment. At that same time, a news release was distributed to the news media within the Shasta-Trinity National Forests' zone of influence outlining the public review process and encouraging public participation.

Public briefings on the contents of the two documents were held in Redding, Weaverville and Mt. Shasta during April of 1990.

Formal Public Hearings on the two documents were held in June of 1990 in Redding, Weaverville and Mt. Shasta.

On June 22, 1990, during the public review period, the U.S. Fish and Wildlife Service listed the northern spotted owl as a threatened species under the Endangered Species Act. That action significantly changed the range of management opportunities displayed in the Draft EIS and proposed Forest Plan. The Forest Supervisor subsequently announced that revised documents would be issued. The revised documents would provide the public with an opportunity to review and comment on the full disclosure of the effects of the listing of the spotted owl. Public comments were encouraged and continued to be received until the comment period closed on July 7, 1990.

By the end of the public comment period, 1,656 responses were received and their contents analyzed. Subsequently, the 30 public issues addressed in the Draft EIS were re-evaluated. Some of the public issues did not warrant further consideration; they were either dropped or combined with other issues. The list was narrowed down to 21 public issues that are addressed in this Draft EIS and the accompanying proposed Forest Plan.

A January 22, 1991, Notice of Intent was published in the **Federal Register** announcing that the Forest Service would issue a revised Draft EIS and proposed Forest Plan during the Winter, 1991-92.

On January 28, 1991, a letter was sent to everyone on the planning mailing list updating them on the status of the proposed Forest Plan.

Another Notice of Intent was published in the December 4, 1992, **Federal Register** changing the date for issuing the revised documents to Spring, 1993.

Review Of Other Agency/Native American Tribal Plans

U.S. Department of Interior-Bureau of Land Management (BLM)

Resource Management Plan - Redding Resource Area

Forest personnel participated in the review of the resource situation analysis involved in the preparation of the above plan. This provided the Shasta-Trinity with an opportunity to ensure that the management directions prescribed on adjacent National Forest lands in the Draft EIS and proposed Forest Plan were compatible with BLM management direction.

U.S. Department of Interior-Bureau of Indian Affairs (BIA)

Klamath River Basin Fisheries Resource Plan

This plan was used in the development of the analysis of the management situation for the fishery resource. This plan was used to establish management opportunities for habitat improvement, to gather histories of past anadromous fish runs, to determine current and projected estimates of fisherman demands and use patterns, and to describe current habitat conditions.

U.S. Department of Interior-Bureau of Reclamation

Proposed Trinity River Basin Fish and Wildlife Management Program (October, 1980)

This plan was used to develop background information and histories of past fish runs for the analysis of the management situation for the fishery resource.

U.S. Department of Interior-Fish and Wildlife Service

Final Environmental Impact Statement (Final EIS) - Proposed Trinity River Basin Fish and Wildlife Management Program

This Final EIS was used to establish fishery habitat improvement opportunities and feasible production goals for the Trinity River Basin fishery.

U.S. Department of Interior-National Park Service

Whiskeytown-Shasta-Trinity National Recreation Area (NRA) - Whiskeytown Unit Master Plan

This Plan was used to coordinate recreation management between the Forest Service and the National Park Service units of the NRA. The resulting management direction was incorporated into the supplemental management direction for the Management Areas comprising the Shasta and Trinity Units of the NRA. Refer to Chapter 4 of the proposed Forest Plan.

State of California - Department of Fish and Game (DFG).

Hayfork Deer Herd Management Plan

McCloud Flats Deer Herd Management Plan

Weaverville Deer Herd Management Plan

Yolla Bolla Deer Herd Management Plan

These plans were used to incorporate some of the wildlife goals and objectives in the proposed Forest Plan. They were used to establish projected levels of hunting use, and to evaluate and describe current and projected population conditions for game species for the analysis of the management situation.

Shasta, Tehama, Siskiyou, and Trinity Counties

General Plan(s)

These plans were used to ensure maximum compatibility of direction on Shasta-Trinity National Forests lands with adjacent private landowners. Close review of the Shasta County General Plan was made with respect to private land uses allowed within the Shasta Unit of the NRA and recreational subdivisions adjacent to National Forest lands elsewhere on the Forests. These plans had broad implications on land ownership direction shown as supplemental direction under each of the 22 Management Areas identified in the proposed Forest Plan.

APPENDIX B

The Modeling and Analysis Process

APPENDIX B
The Modeling and Analysis Process

I. Introduction

The purpose of this Appendix is to present a technical discussion of the analysis process and models used in Forest planning. Basic assumptions, model components and inputs, modeling rules and methods, and modeling constraints imposed, along with their rationale and impacts, are described in this Appendix. Information presented here supplements the broader and less technical descriptions that are included elsewhere in this Draft Environmental Impact Statement (Draft EIS). See Chapter II for a description of the overall process, the results of the benchmark analysis, additional discussion of the alternatives, and a discussion of opportunity costs associated with Forest constraints.

FORPLAN, a linear programming model, is the primary modeling tool used to assure that land allocations and output schedules are made in a way that meets all constraints in the most cost-efficient manner possible. In addition to being used to formulate alternatives and benchmarks, FORPLAN is used to perform detailed accounting work and to generate summary reports of information needed to construct the display tables in this Draft EIS.

Six additional models were used to generate input data for use in FORPLAN, to interpret output data from FORPLAN, and to assist in the spatial allocation of FORPLAN to meet various alternative themes.

- The FIREPLAN system was used to estimate the fire organization, activity levels, and fire management costs required to efficiently achieve the program direction for each alternative.
- The U.S. Department of Commerce's Regional Industrial Multiplier System (RIMS) was used to develop impact multipliers, plus employment and income estimates for the alternatives analyzed in this Draft EIS.
- A Forest Plan Data Base was developed to define land units (i.e. analysis areas) and acres of suitable prescriptions by alternative.
- A Geographic Information System (GIS) used the Forest Plan Data Base to visually display timber suitability which, in turn, was used in the mapping and development of the Forests' alternatives.
- A Wildlife and Fish Habitat Relationship system (WFHR) was used to model and analyze the alternative's effects on forest habitats.
- The Effective Alteration (EFFALT) modeling employed perspective plot computer simulations to correlate levels of timber harvesting with visual quality objectives (VQOs). More detailed descriptions of these models appear in Section III of this Appendix.

II. The Forest Planning Model

A. Overview

FORPLAN is a specialized matrix generator and report writer for a standard linear programming algorithm, the Functional Mathematical Programming System (FMPS). This is the linear programming code used with PC FORPLAN. Linear programming is a standard mathematical technique for solving simultaneous linear equations subject to a certain set of constraints and a particular objective function. In its simplest form, this is expressed mathematically as:

Maximize: $z = {}^{c}1^{x}1 + {}^{c}2^{x}2 + \ldots\ldots {}^{c}n^{x}n$
(Objective function)

Subject to: ${}^{a}11^{x}1 + {}^{a}12^{x}2 + \ldots\ldots {}^{a}1n^{x}n \leq {}^{b}1$

${}^{a}21^{x}1 + {}^{a}22^{x}2 + \ldots\ldots {}^{a}2n^{x}n \geq {}^{b}2$ (Constraint set)

${}^{a}m1^{x}1 + {}^{am2^{x}}2 + \ldots\ldots {}^{a}mn^{z}n \leq {}^{b}m$

$xj \geq 0$

These mathematical expressions can also be seen in **Table B-1.**

In the FORPLAN formulation, the linear equations (rows) represent resource production functions, costs, and acreage or other types of constraints. For example, row 1 might represent timber production; row 2 might represent total cost; row 3 might represent acres burned by wildfire. The columns j = 1,n represent the different activities (prescriptions) which can occur over time on specific units of land called analysis areas (represented by xj). The aij coefficients in the Matrix are the production, cost, or resource coefficients associated with each

Table B-1
Matrix

	Column j=1	Column j=2	Column j=3	Column j=n	Constraint Type	Right Hand Side Constraint
Objective Function	c_1x_1	c_2x_2	c_3x_3	c_nx_n	Maximize	
Row i=1 (Timber)	$a_{11}x_1$	$a_{12}x_2$	$a_{13}x_3$	$a_{1n}x_n$	≥	b_1
Row i=2 (Cost)	$a_{21}x_1$	$a_{22}x_2$	$a_{23}x_3$	$a_{2n}x_n$	≤	b_2
Row i=m	$a_{m1}x_1$	$a_{m2}x_2$	$a_{m3}x_3$	$a_{mn}x_n$	=	b_m
				x_j	≥	0
				i=1,..m j=1,..n		

prescription/analysis area combination. The b1's are the right-hand side constraints representing exact amounts (=) or upper () or lower () constraint levels that must be met. In the example above, if row 1 represented timber production, the interpretation of the constraint

$$a_{11}x_1+a_{12}x_2+a_{13}x_3....+a_{1n}x_n>b_1$$

would be: the total amount of timber produced from all prescriptions and analysis areas must be greater than or equal to the amount of b1.

In the Forest planning model, with few exceptions, the objective function is to maximize present net value (PNV) for 10 decades for each prescription/analysis area combination. PNV, expressed in dollars, is a total of all benefits and costs, discounted to the present time.

The FORPLAN model was built by representing the production functions, costs, values, and resource supplies for the Forests in the mathematical format described above. For the Shasta-Trinity National Forests the resulting model contained approximately 7,400 columns and 1,500 rows. Once the model was formulated, several test runs were made to check the model for reasonableness and to make additional calibrations. Land allocations, activity and output schedules, costs, benefits, and PNV were developed by altering the prescriptions' intensity. The objective function and constraints were then set to meet the theme of each alternative and benchmark.

Unique constraint sets were developed to represent minimum management requirements (MMRs), minimum implementation requirements (MIRs), Forest management requirements (FMRs) common to all alternatives, and specific land allocations and output schedules needed for individual alternatives.

An iterative process was used to formulate these constraint sets prior to making final FORPLAN runs for the alternatives and benchmarks (see the Benchmarks and Alternatives Sections [M and N], respectively, of this Appendix).

FORPLAN was used to determine the most cost-efficient mix of goods and services that could be produced from the Forests based on the objectives and constraints of each alternative. The tradeoffs made among alternatives were examined, and the costs and benefits associated with each objective or constraint were measured. This analysis provided a way of indirectly evaluating the non-priced benefits by measuring the amount of PNV foregone. The final criterion used to evaluate alternatives was net public benefits (NPBs), the PNV plus consideration of non-quantifiable Forest resource benefits.

Management activities modeled in FORPLAN were determined by the Forests' interdisciplinary team. This pre-FORPLAN analysis included identifying:

- The activities that could be applied to National Forest system land;
- those activities that could be modeled in FORPLAN;
- the kinds of land to which each activity could be applied;
- the costs, outputs, and benefits which would result from the application of each activity to a specific type of land; and
- the compatibility of activities when applied to the same land area.

This provided the basis for a matrix of all possible management activities which could be modeled, along with their associated costs, outputs, and benefits.

B. Land Units

Capability areas are the smallest units of land (or water) for which data is collected in forest planning. They are discrete and recognizable units classified according to physical (soil), biological (vegetation), and administrative factors. All land within a capability area is homogeneous in its ability to produce resource outputs and in its production limitations. The capability areas are homogeneous with respect to land status, forest type, condition class, and National Forest group (i.e. Shasta National Forest and Trinity National Forest).

Additional information was also needed for each capability area to assess resource opportunities and public issues. A few of the important items assessed included Ranger District boundary, compartment boundary, slope, aspect, timber productivity class, timber suitability for regeneration, length of perennial, inner gorge, and intermittent streams, spotted owl habitat conservation areas (HCAs), and roadless areas. (For more detailed information see the LMP90 Data Dictionary for Land Management Planning, June, 1992.)

Because there are over 67,000 capability areas within the Forests, they could not all be used in FORPLAN. Use of such a large number of land units would be cumbersome and expensive and would have exceeded the matrix size limits that can be used in FORPLAN. Analysis areas were created to handle this problem. Conceptually, an analysis area is an aggregate of capability areas that responds to a given management prescription in a uniform way.

The delineation of the analysis areas involved aggregation of the capability areas into approximately 90 analysis areas, based on physical, biological, and administrative attributes. Major considerations in attribute selection were timber yield capability and cost. The selection of which attributes to include in FORPLAN was guided by factors such as forest type, condition class, site class, slope, and accessibility; these factors are the largest determinants of yield and cost.

Next, the analysis areas were defined using each attribute as a level of stratification or level identifier in FORPLAN. Because of model size limitations, the number of attributes selected initially exceeded the number that could be used. This necessitated the selection of the most critical attributes necessary to address the planning problems and to consider the reliability of the data for making yield and cost estimates. The attributes selected and the categories within each attribute were defined as follows:

National Forest Group

Shasta National Forest
Trinity National Forest

Habitat Conservation Area

Inside HCA
Outside HCA

Quarter township: 50-11-40

Quarter township meets 50-11-40
Quarter township does not meet 50-11-40

Timber Suitability

Lands potentially suitable for all timber intensities.
Lands potentially suitable for all timber intensities, except thinning.
Lands unsuitable for regulated timber harvest.

Forest Type

Douglas-fir (DF)
Grass (GR)
Hardwoods (HW)
Knobcone Pine (KP)
Lodgepole Pine (LP)
Mixed Conifer (MC)
Ponderosa Pine (PP)
Red Fir (RF)

Condition Class

SM - Regeneration growing under GTR
P1 - Plantations 0-10 years
P2 - Plantations 11-20 years
P3 - Plantations 21-35 years
2G - saplings and poles >40 percent crown closure
2P - saplings and poles <40 percent crown closure
3G - small and medium sawtimber >40 percent crown closure
3P - small and medium sawtimber <40 percent crown closure
4G - large sawtimber >40 percent crown closure
HW - Hardwood on Conifer site
XX - All size and density classes

The **National Forest group** identifier was used to determine how FORPLAN treats timber regulation between the two Forests. Although the entire Shasta-Trinity National Forests was modeled as a whole, the Shasta and Trinity Forests present distinctive and contrasting differences with respect to standing timber inventory, growing stock, and growth conditions. Unique timber yield tables were developed by Forest.

The **Habitat Conservation Area (HCA)** identifier was used to separate analysis areas by HCA/non-HCA as required for analysis of 50-11-40. Land inside HCA boundaries is withdrawn from the quarter township 50-11-40 analysis.

The **Quarter township: 50-11-40** identifier was used to separate quarter townships that meet 50-11-40 from those that do not. According to the Interagency Scientific

Committee's report, "Conservation Strategy for the Northern Spotted Owl" (April 1990) no regeneration harvesting may occur in a quarter township unless more than 50 percent of the acres have trees with an average diameter-at-breast height (dbh) of 11 inches and 40 percent crown cover (on those acres capable of meeting the requirement).

The **timber suitability level** identifier was used to determine the range of timber intensities that could be applied to each analysis area based on suitability for regeneration.

The **forest type and condition class** identifiers were structured in accordance with the RAMPREP yield tables used in FORPLAN. A unique set of cost/financial tables was also used with various combinations of these identifiers.

C. Management Areas

National Forest land within the Shasta-Trinity National Forests has been divided into 22 management areas. Each area has distinct management direction in response to local issues and intrinsic resource opportunities. However, these areas were not identified as management areas in FORPLAN. They will be used as a means of disaggregating FORPLAN outputs from the Preferred Alternative to the Ranger District level.

D. Prescriptions

A prescription consists of a set of management practices and the schedule for application to achieve desired objectives on a specific area. For a given analysis area, the range of prescriptions describes what could be done (i.e., the possibilities) on that area. FORPLAN is used to determine what should be done based on the constraints and objective function of an alternative.

Prescriptions used in Forest modeling were derived from management prescriptions developed by the Forests' interdisciplinary team. Management prescriptions are a mix of compatible management practices. The interdisciplinary team quantified the outputs, costs, and benefits that would occur when a prescription is applied to a given analysis area or unit of land. This quantification process produced the outputs, costs, and benefit coefficients that were used in the FORPLAN yield and economic tables.

1. Management Prescriptions. It is important to distinguish between FORPLAN prescriptions and management prescriptions. FORPLAN prescriptions are sets of activities which could occur on the analysis areas; they can be modeled in FORPLAN. They are "generic" activities in that they are written without imposition of standards and guidelines needed to fit activities to site specific conditions. Management prescriptions, on the other hand, are written as a result of allocating FORPLAN prescriptions to specific land areas and imposing certain standards and guidelines. A management prescription includes the FORPLAN prescription as one of its parts, but it also includes additional practices needed to meet standards and guidelines at specific sites.

FORPLAN prescriptions are developed to allow for a full range of management activities on an analysis area. In that way a choice can be made between an intensive management practice or a non-intensive management practice. Limiting the number of prescriptions to choose from is a type of "built-in" constraint. The choice of prescriptions identified for each analysis area was constrained only by technical feasibility. The FORPLAN prescriptions which were analyzed are described briefly below. Additional information, as well as the prescriptions and the prescription development process, is included in Chapter II and in the official planning records at the Forest Supervisor's Office, 2400 Washington Avenue, Redding, CA 96001.

2. FORPLAN Prescriptions. The prescriptions listed below consist of two levels: Management Emphasis (ME) and Management Intensity (MI). ME levels are generally equivalent to prescriptions, while MI levels are analogous to management practices or options related to the prescription itself.

The descriptions below summarize the ME/MI combinations shown in detail in **Table B-2.** This table shows the relationship between FORPLAN prescriptions and management prescriptions. Some of the FORPLAN prescriptions are applied to more than one management prescription or to certain types of analysis areas (e.g., unsuitable timber land analysis areas).

a. The following are timber management related FORPLAN prescriptions:

   (1) Timber Management-Unsuitable Lands (TM-UNS). This prescription applies to all lands from which no chargeable timber volume is planned. Management objectives either preclude timber production or are so restrictive that silvicultural objectives cannot be met. Examples are non-capable, unavailable, and unsuitable lands; proposed wildernesses and research natural areas (RNAs); cultural and developed recreation sites; and threatened and endangered species (T&E) habitats.

   (2) Timber Management-Marginal Yield Objectives (TM-MRG). This prescription includes suitable timber lands where management objectives are such that some minor timber yields are scheduled. Another name for this prescription is Minimal Timber. Average rotation age is 300 years. Timber outputs are regulated as a

Table B-2
Management Prescription FORPLAN Prescription Linkage
Timber Management Related Prescriptions

Management Prescription		FORPLAN Prescription Management Emphasis*	Management Intensity
I	Unroaded Non-Motorized Recreation	TM-UNS	Unsuitable
II	Limited Roaded Motorized Recreation	TM-MRG	Stand Maintenance
III	Roaded Recreation		
	Partial Retention	TM-REG	Clearcut Green Tree Retention Shelterwood Selection Stand Maintenance Commercial Thinning
	Retention	TM-MRG	Stand Maintenance
	Shasta Lake NRA	TM-UNS	Unsuitable
IV	Roaded, High Density Recreation	TM-UNS	Unsuitable
V	Wilderness Management	TM-UNS	Unsuitable
VI	Wildlife Habitat Management	TM-REG	Clearcut Green Tree Retention Shelterwood Selection Stand Maintenance Commercial Thinning
VII	Threatened, Endangered, & Selected Sensitive Species		
	Bald Eagles	TM-UNS	Unsuitable
	Peregrine Falcons	TM-UNS	Unsuitable
	Goshawks	TM-UNS	Unsuitable
	Sensitive Plants	TM-UNS	Unsuitable
	Spotted Owls	TM-UNS	Unsuitable
		TM-MRG	Stand Maintenance
VIII	Timber Management	TM-REG	Clearcut Green Tree Retention Shelterwood Selection Stand Maintenance Commercial Thinning
IX	Riparian Management		
	Perennial Streams/Inner Gorge	TM-MRG	Stand Maintenance
	Intermittent/Ephemeral Streams	TM-UNS	Unsuitable
		TM-UNS	Unsuitable
		TM-REG	Clearcut Green Tree Retention Shelterwood Selection Commercial Thinning Stand Maintenance
X	Special Area Management	TM-UNS	Unsuitable
XI	Cultural Resource Management	TM-UNS	Unsuitable
Non-capable, Unavailable, and Unsuitable Land Within Above Management Prescriptions		TM-UNS	Unsuitable
Developed Recreation		DEVREC	Low Standard Standard Rehabilitation New Construction

Table B-2
(Continued)
Timber Management Related Prescriptions

Management Prescription	FORPLAN Prescription	
	Management Emphasis*	Management Intensity
Dispersed Recreation	DSPREC	Low Standard Standard Rehabilitation New Construction
Fire Management	FIRE	NFMAS Program -25% Program

* TM-MRG Timber Mangement-Marginal Yield Objectives
TM-REG Timber Management
TM-UNS Timber Management-Unsuitable Lands

separate, noninterchangeable component of the allowable sale quantity (ASQ). Stand maintenance and salvage are included in this prescription. Examples of areas where this prescription applies are in visual retention areas and semi-primitive motorized recreation areas.

(3) Timber Management-Reduced Yield Objectives (TM-REG). Includes suitable timber lands where management objectives allow for even-aged and uneven-aged systems. Rotations vary from 90 to 160 years with the average rotation being 120 years.

b. Prescriptions were also made for developed recreation, dispersed recreation, and fire management. Alternative program levels were analyzed for each alternative. These resource related prescriptions were defined as follows:

(1) Developed Recreation-Low Standard (DEVREC-LOWSTD). Existing facilities would be open at a level such that the user's willingness to pay is less than at the standard level.

(2) Developed Recreation-Standard (DEVREC-STNDRD). Existing facilities would be open with all improvements and operation at standard levels.

(3) Developed Recreation-Rehabilitation (DEVREC-REHABST). Facilities at low standard condition are rehabilitated to the standard level resulting in outputs at the standard level.

(4) Developed Recreation-New Construction (DEV-REC-NCONST). Facilities can be built on certain lands to standard level.

(5) Dispersed Recreation-Low Standard (DSPREC-LOWSTD). Existing roads and trails would be open at a level such that the user's willingness to pay is less than at the standard level.

(6) Dispersed Recreation-Standard (DSPREC-STNDRD). Existing trails would be open and maintained at standard levels.

(7) Dispersed Recreation-Rehabilitation (DSPREC-REHBST). Existing roads and trails at low standard are rehabilitated to the standard level resulting in outputs at the standard level.

(8) Dispersed Recreation-New Construction (DSPREC-NCONST). Planned trails would be built to standard levels.

(9) Fire Management Program (FIRE). Consists of varied mixes of manpower, engines, prevention, detection, and aircraft resources, along with fuels management. The most efficient program was selected and then reduced 25 percent to respond to budget issues.

3. **Assignment of Timber Management Intensities by Analysis Area.** Based on the technical suitability of the land, certain intensities are applied. These intensities vary from analysis areas that are less than 40 percent slope, and forest types and condition classes of MC3G, DF3G, RF2N, and MC2G where all intensities are considered; to analysis areas that are unsuitable for regulated harvest where only Unsuitable is applied.

Unsuitable is applied as an option on all lands. For any of the analysis areas doing nothing and allocating the land to **Unsuitable** is always an option.

Stand Maintenance is applied to all suitable timber land. Since this intensity removes so little timber volume during any entry, it can be applied on areas where regeneration is very difficult (i.e. low site).

Selection is limited to land that is less than 40 percent slope and forest types and condition classes of RF2N, DF3G, MC2G, MC3G, and PP3P exist. Because of the difficulty of using cable logging systems with **Selection**, it is not considered feasible on slopes greater than 40

percent. Where suitable acres are not open to clearcutting, selection cutting is permitted only on high site land. Forest types and condition classes that are old and/or poorly stocked are also considered unsuitable for this intensity.

Shelterwood can be applied on any suitable high site lands where the following forest types and condition classes exist: DF4G, DF3G, MC3G, MC2G, RF3G, RF2N and plantations. Shelterwood is not applied on poorly stocked lands because many of these areas do not have 10 to 20 percent good crown, seed/shelter trees, which are considered the minimum stocking necessary to apply this intensity. Shelterwood is also not applied in low site land where clearcutting is not permitted.

Green Tree Retention is applied only on lands suitable for clearcutting. The difficulty of obtaining regeneration lands precludes this intensity from these analysis areas.

Thinning to the 50-11-40 rule can be applied to any suitable timber land with any commercial species except lodgepole pine or hardwoods.

Clearcutting is applied only on lands suitable for intensive even-aged harvest systems. The difficulty of obtaining regeneration on other lands precludes this intensity from these analysis areas.

From a financial analysis standpoint no timber management intensities were eliminated because of having a low or negative present net value (PNV).

E. Time Periods

To facilitate modeling the scheduling of outputs and activities on the Forests for the 150 year planning horizon, 10 years (one decade) was the basic reporting period chosen. Consequently, outputs are modeled as totals or averages for 10 year periods, and constraints were applied to outputs or activities on a 10 year basis. In order to reduce the complexity of data displayed in this Draft EIS five decades are used in all display tables.

F. Outputs

Development of Modeling Coefficients. Following is a description of the coefficients used for outputs tracked inside and outside of FORPLAN. A brief discussion of how each coefficient was developed is also included here. A more detailed discussion is available in the Forests' planning records. **Table B-3** shows a listing of all outputs used in the analysis process.

a. Modeled Inside FORPLAN

Facilities

Road Construction/Reconstruction. When the road network is completed, it is assumed that an average road density of 6 miles/square mile would exist on suitable timber land. For analysis areas defined as roaded 3.5 miles per square mile are assumed to have already been built and thus 2.5 miles per square mile are needed. For roadless areas 6 miles/square mile of new roads would be needed. For group selection the average road density is increased to 7 miles/square mile to complete a road network. Otherwise, the same assumptions apply as stated above.

Forty percent of the roads are proportional to acres treated by management intensity and 60 percent due to allocation. The rates of development vary by FORPLAN prescription. In decade 1, for timber management, 30 percent of the needed roads would be built. For modified timber, 45 percent would be built in decade 1.

For road reconstruction it is assumed that .325 miles of road would have to be built for every million board feet (MMBF) of timber produced.

Fire and Fuels

Fuel Treatment (Timber and Non-Timber). This output is the sum of two kinds of fuel treatments: natural and activity fuel. The natural fuel treatment acres were calculated by adding the probable acres to be treated for wildlife habitat improvement to the acres to be treated under a fuels management program. Acres treated under activity fuels were calculated directly from FORPLAN using acres treated for site preparation. These outputs are coincidental to other activities and require no suitable timber land acre constraints.

Fisheries

Fish User Days (FUDs) and Direct Habitat Improvement (Acres). Over 90 percent of the FUDs are assumed to occur as background. For all alternatives these are included in FORPLAN, and they increase at 1.5 percent annually. Ten percent of the background FUDs are assumed to be produced from anadromous fish and 90 percent from inland fish. The remaining FUDs are produced as a result of direct habitat improvement. Total direct habitat acres are estimated based on the theme of the alternative.

Range

Grazing. This output measures actual animal months (AMs) per acre per year. This is based on the assumption that 50 AMs would be produced for each MMBF of timber harvested.

Table B-3
Outputs Used in Analysis

Output	Units of Measure	Modeled Inside FORPLAN	Modeled Outside FORPLAN
Facilities			
Transportation			
Trail Construction	Miles		X
Road Construction	Miles	X	
Road Reconstruction	Miles	X	
Road Maintenance	Miles		X
Dams and Reservoirs	Number		X
Administrative Sites	Number		X
Fire and Fuels			
Fuel Treatment (Timber)	Acres	X	
Fuel treatment (Non-timber)	Acres		X
Expected Acres Burned by Wildfire	Acres		X
Fish			
Resident (Other than T&E)	MLbs		X
Anadromous Fish			
Commercial Harvest	MLbs		X
Sport	MLbs		X
Fish User Days - Total	FUDs	X	
Direct Habitat Improvement			
Resident Fish (except T&E)	Acres		X
Anadromous Fish - Sport	Acres		X
Total	Acres		X
Direct Habitat Improvement			
Resident Fish (except T&E)	Acres/#of Structures		X
Anadromous Fish - Commercial	Acres/# of Structures		X
Anadromous Fish - Sport	Acres/# of Structures		X
Human Resources			
Programs	# of Enrollees		X
Lands and Minerals			
Land Acquisition	Acres		X
Minerals (Operating Plans)	# of Plans		X
Range			
Grazing	AMs	X	
Recreation			
Developed Public Recreation	RVDs	X	
Developed Private Recreation	RVDs	X	
Dispersed Recreation	RVDs	X	
Wilderness	RVDs	X	
Area Open to OHV Use	Acres		X
Area Closed to OHV Use	Acres		X
Area Restricted to OHV Use	Acres		X
Area with Seasonal OHV Use	Acres		X
Recreation Opportunity Spectrum (ROS)	Acres		X
Timber			
Allowable Sale Quantity (ASQ)	MMCF/MMBF	X	
Reforestation	Acres	X	
Timber Stand Improvement	Acres	X	
Firewood	MCords		X
Dispersion	Acres	X	
Visual Quality			
Visual Quality Index			X
Effective Alteration	Acres	X	
Water	Acre/Feet		
Water Quality	(at standard)		X

Table B-3 (Continued)

Output	Units of Measure	Modeled Inside FORPLAN	Modeled Outside FORPLAN
Water (Continued)			
Increased Water Quantity (Water Yield)	Acre Feet	X	
Watershed Improvement	Acres		
Watershed Condition/Cumulative Watershed Impacts	ERA Acres		X
Wildlife			
Threatened & Endangered (T&E) and Sensitive Species			
Bald Eagle	Acres	X	
Goshawk	Acres		X
Peregrine Falcon	Acres	X	
Spotted Owl	Acres	X	
Habitat Capabiltiy (Other than T&E)			
Big Game - Deer	Animal #		X
Wildlife User Days - Background	WUDs	X	
Habitat Improvement			
All Species	WUDs		X
Habitat Improvement			
All Species	Acres/# of Structures		X
Seral Stages - Wildlife Habitat Relationships	Acres	X	

Abbreviated Terms and Meanings

AMs	Animal Months
ERA	Equivalent Road Acres
FUDs	Fish User Days
MCords	Thousand Cords
MLbs	Thousand Pounds
MMBF	Million Board Feet
MMCF	Million Cubic Feet
OHV	Off-highway Vehicle
RVDs	Recreation Visitor Days
WUDs	Wildlife User Days

Recreation

Developed Public and Private Recreation. A coefficient representing recreation visitor days (RVDs)/acre/year was developed by determining the annual number of RVDs which are provided by the total acres of existing land for developed site recreation. The source of the data used in development of coefficients was the Recreation Resource Information System (RRIS) and the National Forest Recreation Survey (NFRS). Alternatives vary by the proportion of demand achieved by low versus standard RVDs. No tentatively suitable timber acres are constrained for this purpose.

Dispersed Recreation. A coefficient representing RVDs/acre/year for dispersed recreation was developed by using RRIS data to determine the annual number of RVDs which are provided by the total acres of average suitability land for dispersed recreation. Alternatives vary by the proportion of demand achieved by low versus standard RVDs. No suitable timber acres are constrained for this purpose.

Wilderness. Coefficients for wilderness recreation use were developed by dividing the total area in wilderness (as of 1982) by the total RVDs use figures from RRIS. Alternatives vary by the proportion of demand achieved by low versus standard RVDs.

Timber

Allowable Sale Quantity (ASQ). Timber yield coefficients were developed from a Forest timber inventory completed in 1980 and updated in 1990. Data from this inventory was used to develop yield tables using a growth simulation model called RAMPREP. Growth and yield modeling was done for each timber stratum/type and site class for existing and future regenerated stands. See **Table B-4.**

Table B-4
RAMPREP Yield Tables Used

Existing Strata	Dunning Site Class: Shasta	Dunning Site Class: Trinity
M2G	III	II
M2P	III	III
M3G - High	II	III
M3G - Low	V	V
M3P - High	II	III
M3P - Low	V	V
D3G	N/A	I
D3P	N/A	II
D4G	N/A	I
R2N	V	N/A
R3G	III	N/A
R3P	III	N/A
P3P	IV	N/A
LPX	IV	N/A
Regenerated Stands		
High	II	III
Low	IV	IV

Inventory data and RAMPREP yield tables are included in the Forest planning records and are available for review at the Forest Supervisor's Office in Redding, California.

Reforestation. Reforestation acres were equal to the acres of regenerated timber harvests scheduled by FORPLAN. Regenerated harvests included clearcutting, green tree retention, shelterwood cutting, and selection cutting. This allows for a small amount of natural regeneration and some replanting.

Timber Stand Improvement (TSI). TSI includes release and precommercial thinning. The acres of TSI treatment were based on a percentage of the reforestation acres. Approximately 90 percent of the reforestation acres (including backlog) were assumed to require a release treatment and 60 percent would be precommercially thinned.

Dispersion. The intent of this output and constraint is to leave manageable units between harvest units which are considered openings. This requirement applies only to regeneration harvest openings created by even-aged timber management. An opening created by even-aged timber management would no longer be considered an opening once the trees have reached 4.5 feet in height.

Coefficients were developed to depict the number of regeneration harvest acres that could be cut in any one decade to meet dispersion requirements. The actual coefficients used were based on studies done on sample photos and compartments on the Eldorado, Plumas, and Sierra National Forests. Coefficients used were developed by the Pacific Southwest Region (Region 5) and incorporated into the Forests' FORPLAN analysis.

Dispersion is a proxy for the visual quality objective (VQO) Maximum Modification. Permissible maximums were defined and applied to the FORPLAN model as a constraint. For an Intensive Timber regime (TM-FUL) not more than 34 percent of the dispersion altered acres and not more than 23 percent of the timber inventory could be harvested over two decades. See planning record *Dispersion of Timber Harvest* for more information.

Visual Quality

Effective Alteration (EFFALT). This output is expressed in acres effectively altered by vegetation changes. Coefficients were developed to depict the number of regeneration harvest acres that could be cut in any one decade to meet visual resource requirements. The actual coefficients used were devised from analysis of perspective modeling done in Region 5. Coefficients used were developed by the Region and incorporated into the Forests' FORPLAN analysis.

Permissible maximums of visually altered acres were defined by VQO. A table for each VQO class was constructed. Within this table, maximums were also defined for the percent of timber inventory that could be harvested by VQO class. These constraints were then linked to FORPLAN prescriptions.

Under a Minimal Timber regime (TM-MRG) not more than 5 percent of the timber inventory could be harvested in any decade (Retention VQO). For a Regular Timber regime (TM-REG) not more than 15 percent of the visually altered acres could be harvested over two decades and not more than 15 percent of the timber inventory (Partial Retention VQO).

Tentatively suitable timber acres devoted to TM-MRG, and TM-REG regimes vary according to the theme of the alternative. For more information on how TM-MRG, and TM-REG vary by alternative see the Constraints Unique to An Alternative Section in this Appendix.

Water

Increased Quantity (Water Yield). Water yield outputs, derived from calculations using collected (U.S. Geological Survey) water yield data and coefficients, take into account changes due to modification of the water balance caused by vegetative manipulation. Present water yield was determined by extrapolating measured flows from 23 Geological Survey gauging stations located within or near the National Forests. From this data a Forest-wide average water yield was calculated.

To account for the variability of runoff from various Forest types, the 30 identified timber (vegetation) strata for the Forests were combined into five groups having similar runoff characteristics. The Forest-wide average water yield was modified to determine a runoff coefficient

reflective of the groups' runoff potential. Group 1 consists of timber strata having high evapotranspiration rates, and thus low runoff rates. The Group 1 runoff coefficient is 2.2 feet/acre/year. Group 5 consists of timber strata having high runoff rates such as rock outcrop and surface water. The Group 5 runoff coefficient is 4.7 feet/acre/year. Groups 2, 3, and 4 have runoff coefficients of 2.5, 2.9, and 3.4 feet/acre/year, respectively.

Changes in water yield due to forest management activities were calculated based on temporary type conversion from one stratum to another, such as brush (2.5 feet/acre/year) to grass (3.4 feet/acre/year). When prescribed management reduces evapotranspiration by reducing vegetation, the water yield increases initially, then decreases to pretreatment back over a period of 20 years. Management activities considered included clearcuts, shelterwood cuts, intermediate thinning and brush to grass conversion. Changes in water yield were calculated over the life of the plan using this time streaming method. Although water yield is affected by forest management practices, it is a coincidental output and requires no constraints on the suitable timber lands.

Watershed Condition/Cumulative Watershed Impacts. The potential effects to watershed conditions were evaluated within FORPLAN through the evaluation of cumulative watershed impacts (Appendix H). A model was developed within FORPLAN which calculated Forest-wide Equivalent Road Acres (ERAs) generated from silvicultural activities for each decade. ERAs were calculated, within the model, through the use of disturbance coefficients for each type of harvest activity including clearcutting, selection harvesting, thinning, etc. These coefficients took into account site disturbance from either cable or tractor harvest systems and roading levels necessary to access harvest units. The resulting ERAs were adjusted over three decades to account for natural recovery due to revegetation. A residual 5 percent ERA was not reduced to account for retained system roads.

For all benchmarks and alternatives the Forest-wide ERAs are lower than the Forest-wide threshold of concern (TOC) constraints. Thus, no constraint was applied in the FORPLAN model for cumulative watershed impacts. This occurs because the dispersion and effalt constraints are more constraining.

The potential effects of proposed management activities on watershed condition were evaluated outside of the FORPLAN model by distributing the individual Forest-wide ERAs generated by the FORPLAN model back to the 61 individual watersheds delineated on the Forests (see Appendix H). The ERA values for decades 1, 5, 10 and 15 were distributed back to the individual watersheds in a manner proportional to their suitable timber acres, minus plantation acres.

Each watershed was then grouped into its appropriate watershed condition class. These classes are based on the relationship between the watershed's ERA level and the TOC. Class 1 watersheds have ERA levels less than 40 percent of their TOC; Class 2 watersheds are between 40 and 80 percent of their TOC; and Class 3 watersheds have ERA levels greater than 80 percent of their TOC. For each of the decades evaluated the watershed acres and the number of watersheds in each watershed condition class were totaled.

This information illustrated the projected trends in watershed condition for each of the alternatives through the entire planning period. It also served as the basis for the analysis of the alternatives in Chapter IV.

Wildlife

Threatened and Endangered (T&E) and Sensitive Species.

Bald Eagle -- The bald eagle was modeled by delineating a number of acres (approximately 350 acres per territory) for current and potential bald eagle territories and assigning these acres to a timber unsuitable prescription.

Peregrine Falcon -- The peregrine falcon territories include approximately 2,100 acres (350 acres per territory), an insignificant amount of which is classified as suitable timber land. Therefore, minor effects on timber management activities are anticipated.

Spotted Owl Habitat -- Spotted owl habitat was provided for based on the requirements of the Interagency Scientific Committee (ISC) Report and the Fish and Wildlife Service's proposed recovery plan for the spotted owl. The actual modeling took two forms: (1) acres identified in the ISC Report as Category I and II habitat capability areas (HCAs) were made unsuitable for any timber prescription. In addition, the Fish and Wildlife Service's critical habitat areas (CHAs) include areas not identified by the ISC, and it is also unsuitable; (2) all land outside of HCAs and CHAs and otherwise suitable for timber management is subject to the ISC 50-11-40 requirement. This requirement means that each 1/4 township must have 50 percent of the suitable timber land with 11 inch average diameter trees and 40 percent crown cover.

In summary, if the area is part of a HCA or CHA, it is unsuitable for timber management. Other areas are only suitable for TM-REG if the 1/4 township meets the 50-11-40 requirement, and only those acres in excess of the 50 percent rule are subject to any form of even-aged management (clearcut, green tree retention, group selection). All areas outside of HCAs and CHAs, that exceed 11-40, can be reduced to the 11-40 requirement, even if the 1/4 township is deficit, through the appropriate silvicultural prescription (thinning, overstory removal...).

Wildlife User Days (WUDs) Background. Includes consumptive (i.e. deer, bear) and non-consumptive WUDs. Consumptive WUDs are assumed to be 282,000 WUDs for decades 1, 2, 3, 4 and 5. Non-consumptive WUDs start at 282,000 WUDs and increase at a 1.5 percent annual rate. The background estimates are included in FORPLAN and are the same for every alternative.

Direct Habitat Improvement (WUDs and Acres) and Induced Habitat Improvement (WUDs). WUDs are produced by Forest Service activities in two ways: (1) by management intensities (i.e. clearcutting, shelterwood, selection) which produce forage and, therefore, induced WUDs; and (2) by burning brush (direct habitat improvement - acres) which produces forage and direct WUDs.

The number of acres of direct habitat improvement varies by alternative. First, a goal is selected based on the theme of the alternative. Second, a FORPLAN run is made that determines induced WUDs based on the mix of management intensities. Third, the induced WUDs are subtracted from the goal and this determines the number of direct WUDs. Fourth, direct acres are estimated by multiplying WUDs by 1.33 Acres/WUD. Finally, the direct acres are input into FORPLAN to account for the total effect WUDs have on PNV inside the model.

Seral Stages - Wildlife Habitat Relationships: Seven seral stages were tracked in FORPLAN ranging from seedlings and saplings to older over-mature habitat. Each forest type and condition class was assigned a proportion of each seral stage now and into the future. FORPLAN thus tracked the number of acres by seral stage for each decade. No suitable timber land acres were constrained to meet seral stage requirements.

b. Modeled Outside FORPLAN

Facilities

Trail Construction/Reconstruction (Miles). No coefficients were developed. This output is based on historic averages with adjustments made for the theme of the alternative.

Road Maintenance (Miles). The number of miles of road maintenance is determined by the current maintenance miles plus new roads constructed for the midpoint of each decade.

Dams, Reservoirs and Administrative Sites (No.). There were no coefficients for this output. Estimates were made based on the budget and theme of the alternatives for the numbers of facilities that would be required.

Fire and Fuels

Expected Acres Burned by Wildfire. Wildfire potential acres were calculated using the National Fire Management Analysis System (NFMAS). Fire modeling was done for specifically Identified Fire Management Analysis Zones using the 1970 decadal fires history records.

Data from the Forests' timber, range, wildlife, and wildfire inventories and records developed a vegetation description model which defined the existing situation. External calculations were made on vegetation change and resubmitted to the NFMAS to determine future vegetation description models impacts on timber, range, wildlife, watershed, and wildfire potential effects over time.

Fisheries

Inland Fish (Thousand [M] Pounds). Poundage estimates were individualized by inland coldwater streams and lakes (rainbow trout) and inland warmwater lakes (largemouth bass). In inland coldwater streams, the assumption was made that all identified low and moderate quality habitat could be increased to high to establish an initial ceiling potential.

With respect to inland coldwater lakes, the assumption was made that identified lake acreage was of low quality and one-third of it could be improved to moderate habitat quality. Also one-third of the identified warmwater lake acreage could be improved from moderate to high quality habitat.

The alternative's theme was used to determine production emphasis by inland fish species. For all three inland fishery types, a potential resource increase was used to generate annual outputs in M pounds.

Anadromous Fish (M pounds). Numbers of fish and associated poundages were estimated for all alternatives, based on the potential catch of chinook salmon, coho salmon, and steelhead trout from National Forest lands in the Trinity River Basin. Escapement potential for these species was determined in concert with Region 1, California Department of Fish and Game (DFG) fisheries personnel (October, 1984). The intent or theme of each alternative was then used to disaggregate total production based on the capability of the alternative to achieve full, high, moderate, or low production emphasis. Increased production was measured against the 1989 base level.

A potential resource increase ranging between 0.5 and 2.0 percent, depending upon alternative emphasis, was used for the anadromous sport fishery to generate annual outputs in M pounds. For the commercial fishery, resource outputs (M pounds) were projected at an evenflow increase (2 percent per year) for the 50-year period until the identified total production was attained.

Direct Habitat Improvement - Inland and Anadromous Fish (FUDs and Acres). The number of acres was calculated as the product of the increase in pounds per acre in habitat quality according to the fishery. Anadromous fish structures are displayed at an average of 8 structures per acre. Inland coldwater streams would receive 10 structures per acre and inland warmwater lakes 1.4 structures per acre. Inland coldwater lakes would be improved through lake enrichment techniques (improvement of nutrients levels).

The total number of acres treated for direct habitat improvement for each fish type (inland and anadromous) were multiplied by management emphasis coefficients, disaggregated by habitat quality emphasis (low to moderate, low to high, etc.) and multiplied by the expected increase in FUDs per acre to achieve a FUD output for each decade for inland and anadromous fish.

Human Resources (Number of Enrollees)

There were no coefficients for this output. Numbers were estimated using historical data and expected budget levels by alternative.

Lands and Minerals

Minerals (Operating Plans [Number of Plans]). There were no plans/acre coefficients developed for this output. The various outputs represent the estimated number of plans associated with locatable minerals, leasable minerals (i.e., oil, gas, and geothermal), and salable minerals, (i.e., sand, gravel, stone, etc.). Outputs vary by the number of acres potentially prohibited (withdrawn) or constrained for mineral development by the management prescriptions. Plans of operation represent the following:

- Work associated with notices of intent or plans of operation filed under 36 Code of Federal Regulations (CFR) 228. Includes preparation of Environment Analyses/Environmental Impact Statements (EA/EIS), and approval and administration of plans of operation.
- Work associated with oil/gas or geothermal operations, including cooperation with U.S. Geological Survey (USGS) and Bureau of Land Management (BLM).
- Work associated with administration, inventorying, and development of common mineral material resources for in-service use. Includes geological investigations and preparation of EA/EIS.

Land Acquisition (Acres). There were no coefficients developed for this output. The acres in an annual purchase program, to more efficiently manage the Forests, were estimated by alternative. The number of acres varied by the theme of the alternative.

Recreation

Off-Highway Vehicle (OHV) Use -- Areas Open, Closed, Restricted, and Seasonally Closed to OHV Use. Acres of National Forest lands open, closed, and restricted to OHV use were determined by totaling the management prescription allocations which correspond to the above categories. Mileage figures by open, closed, and seasonally closed categories were derived similarly (i.e., through examining direction and permitted uses under each management prescription by alternative.)

Recreation Opportunity Spectrum (ROS). The number of acres of ROS class were based on the existing physical setting, scheduled recreation development, timber harvesting, and road and trail construction. Administrative setting was also considered.

Timber

Firewood (M Cords). This output was determined by the total number of firewood permits issued based on historic averages. No coefficients were developed.

Visual Quality

Visual Quality Index (VQI): The VQI was calculated for each alternative using standard Forest Service procedures. The VQI is a means of numerically displaying the effects of alternatives on overall visual quality. Weights were developed by Variety Class and degree of alteration. Those weightings were developed from public preferences for landscape views. See **Table B-5** for Visual Quality Index (VQI).

Table B-5
Visual Quality Index (VQI)

Weight	Variety Class A*	Variety Class B*	Variety Class C*
10	P or I		
9	R or II		
8	PR or III		
7		P or I	
6	M or IV	R or II	
5	MM or V	PR or III	PR or III
4	UM or VI	M or IV	
3		MM or V	M or V
2		UM or VI	
1			P or I, R or II
0			MM or V, UM orVI

* P = Preservation
R = Retention
PR = Partial Retention
M = Modification
MM = Maximum Modification
UM = Unacceptable Modification

Water

Water Quality (Acre Feet). Water that meets water quantity standards is expressed in thousands of acre-feet units. This output was derived by adjusting total induced water yields for the Shasta-Trinity National Forests. Yields derived from watersheds needing to be improved were subtracted from the water yield figures reported by FORPLAN. All remaining yields were assumed to meet water quality standards.

Watershed Improvement (Acres). There were no coefficients for this output. It was assumed that watershed improvement acres would be the same for all alternatives as long as funding is available.

Wildlife

Big Game Numbers (Number of Deer). Estimates of the number of deer were primarily derived from: (1) density coefficients of habitat types; (2) number of acres in those types; and (3) DFG census and harvest information. This analysis indicated an existing estimated base of 65,000 deer. Numbers of deer are considered to be primarily a result of natural and/or man induced habitat alterations and/or processes over time.

Direct and Induced Habitat Improvement - Big Game and Other Wildlife Species (WUDs and Acres). The assumption is made that 85 percent of the direct and induced WUDs and acres calculated by the FORPLAN model are big game and 15 percent other species.

Goshawk Habitat. One-hundred fifty territories were identified in all alternatives, with the acres per territory varying by alternative. All acres assigned to goshawk territories are unsuitable for timber management. Adjustments were made outside of FORPLAN.

G. Economics In FORPLAN

1. General. The subject of economics is discussed throughout this Draft EIS. In Chapter II economics are covered in the alternative development process discussions, and they are displayed in various tables. Chapter III describes the economic environment; the economic consequences are discussed in Chapter IV; and Appendix D outlines how economics are used in this document.

Most of the economic efficiency analysis was done with the use of FORPLAN. The economic data and assumptions that were incorporated into that model are described below.

All dollar values are expressed in 1989 dollars. The following factors, based on the implicit price deflator for the gross national product, were used to adjust values from other years to 1989.

Year	Factor
1995-89	.82
1994-89	.85
1993-89	.87
1992-89	.90
1991-89	.93
1990-89	.96
1989-89	1.00

A discount rate of 4.0 percent was used to determine the PNV of future benefits and costs. This rate approximates the long-term cost of capital in the private sector as measured by the return on AAA corporate bonds after adjustment for inflation.

Real price trends for timber, range, recreation, wildlife and fish were used in all FORPLAN runs.

These price trends are projections from an econometric model of national and regional markets updated for the 1990 Resources Planning Act Final Environmental Impact Statement.

2. Costs. All costs used in the analysis are estimates based on accounting records and the experience of project managers. The most recent costs were collected (i.e. 1992 & 1993) and adjusted to 1989 dollars. The following costs were collected and loaded into FORPLAN:

Facilities

RD-R - road reconstruction
RD-N - road construction due to allocations
RD-N - road construction due to acres harvested
RD-M - road maintenance,existing
RDNM - new road maintenance
RDBD - roads to bed

Fire and Fuels

BRAC - cost of fighting fires
FFP - nonsuppression costs

Range

RNOA - operations and maintenance
RNC - capital investments

Recreation

DVOA - operations and maintenance
DVC - capital investments
B03B - wilderness
DSPC, RH - trail maintenance
DSPC, NC - trail construction

Timber

SALE - sale preparation and administration
SALV - salvage preparation and administration
SITE - site preparation including brush disposal
PLNT - reforestation
RPLT - replant
RLSE - release
PCTH - precommercial thinning

Wildlife and Fish

CW80 - wildlife operations and maintenance
CX80 - fisheries operations and maintenance

Other

TT1T - general administration
MNLV - base level operational costs

Base level operational costs include general administration, FA&O maintenance, trail maintenance, minerals management, lands management, fire detection and initial attack, wildlife maintenance, and water maintenance. Of the various costs included in FORPLAN, those which varied most by alternative were capital investment costs associated with construction/reconstruction of roads and recreation facilities. Operations and maintenance costs, which varied significantly, were timber sale administration.

Costs were checked for reasonableness by comparing the first decade costs for Alternative CUR, developed with the use of FORPLAN, against actual expenditures. Costs for the current alternative deviated by less than 5 percent from actual expenditures. This deviation was within acceptable standards of reliability for Forest planning.

3. Benefits. The dollar values for outputs used to calculate PNV are the prices that consumers would be willing to pay for Forest outputs, whether or not such prices are actually collected by the Federal Government. At present, it is national policy to provide most Forest outputs either at no charge to consumers or at a charge less than the willingness to pay price. (See **Table B-6**).

Benefits for outputs were computed by multiplying the output by the willingness to pay price. Output above the estimated demand was not valued.

For outputs used off-site, benefits are based on the value of the outputs as they leave the land or production site. For outputs used on-site, benefits are valued when use takes place. However, in cases where it is easier to derive values after the output leaves the production site, costs incurred and profits earned after the output leaves the site were deducted from the values at later production stages.

Grazing values are the average amount that National Forest permittees are willing to pay for grazing on the Forests as estimated from ranch livestock budgets developed by the USDA Economic Research Service.

Recreation Visitor Day (RVD) values are the estimated average amount that recreationists are willing to pay to participate in a recreation activity associated with a developed site and/or a dispersed recreation opportunity. These values are based on a survey of travel cost and contingent value recreation studies conducted by the Forest Service for the Forest and Rangeland Renewable Resources Planning Act (RPA) evaluations for 1990.

Timber values are average actual timber receipts (including purchaser road credits) divided by harvest volume reported on cut and sold reports for the period 1988 to 1992 adjusted to 1989 dollars. Proration of price by forest type is based on recent selling values of the timber.

Water values. The 1990 RPA recommended water value of $59 per acre-foot was used. Essentially all of the water yield from the Shasta National Forest can be diverted for agriculture, hydroelectric power, or domestic use. On the Trinity National Forest, where very little of the water yield can be diverted, a value of $6 per-acre foot was used. This $6 value is a proportion of $59, as determined by the acres of diverted and undiverted watersheds.

Wildlife and Fish User Day (WFUD) values are based on studies conducted for the Forest Service which were used in the RPA evaluations for 1990.

A demand curve was developed for WFUDs. This assumes a 1.5 percent annual increase for the next 5 decades. None of the projected outputs for any of the alternatives exceeded this level (See **Table B-7**).

Values for Outputs that Exceed Demand

Benefit values are applied only where there is a demand for the output by the Forests' users. Outputs that exceed demand are given a benefit value of zero, while those that are produced at or below the quantity demanded by consumers are assigned the benefit value described in the previous section. This is handled with the use of a demand cut-off. A demand cut-off was used for RVDs. For this resource output, demand is less than the potential capacity of the Forests. Refer to **Table B-7**.

See Chapter II for a discussion on how costs and benefits interact to determine the PNV for each alternative and how non-valued benefits have trade-offs and opportunity costs.

Table B-6
Benefit Values Used in Analysis

Priced Output	Unit	Average Actual Cash Receipts per Unit of Output	Average Willingness to Pay Value Used in The Analysis
Timber			
Average All Species	MBF	97.00	221.00
Mixed Conifer Type	MBF	99.88	
Ponderosa Pine Type	MBF	133.15	
Douglas-fir Type	MBF	84.04	
Red-fir Type	MBF	57.28	
Lodgepole Pine Type	MBF	46.10	
Range	AMs	1.86	4.91
Recreation			
Dispersed (standard)	RVD	0.00	27.63
Dispersed (low)	RVD	0.00	5.75
Developed (standard)	RVD	0.57	11.20
Developed (low)	RVD	0.57	5.94
Wilderness (standard)	RVD	0.00	14.07
Wilderness (low)	RVD	0.00	6.71
Wildlife and Fish			
Big Game	WFUD	0.00	33.16
Non-game	WFUD	0.00	33.16
Inland Fish	WFUD	0.00	63.31
Anadromous Fish	WFUD	0.00	63.31
Commercial Harvest	Pounds	0.00	1.84
Water			
Shasta NF	Acre/feet	0.00	59.00
Trinity NF	Acre/feet	0.00	6.00

Abbreviated Terms and Meanings:

AMs Animal Months
MBF Thousand Board Feet
RVD Recreation Visitor Day
WFUD Wildlife and Fish User Day

Table B-7
Recreation, Wildlife, and Fish Demand Curves Used in Analysis
(User Days)

Decade	Developed Recreation	Dispersed Recreation*	Wildlife and Fish	Total
1	1,261,000	2,895,000	1,035,000	5,191,000
2	1,453,000	3,360,000	1,201,000	6,014,000
3	1,646,000	3,899,300	1,393,000	6,938,300
4	1,838,000	4,525,200	1,617,000	7,980,200
5	2,031,000	5,251,000	1,877,000	9,159,000

* Wilderness is a part of dispersed recreation. The demand curve for wilderness is assumed to be: decade 1 - 140,000; decade 2 - 163,000; decade 3 - 189,000; decade 4 - 219,000; decade 5 - 254,000.

H. Constraints

Constraints are quantifiable limits placed on the FORPLAN model to assure that only realistic and reasonable amounts of resources are used, that outputs are produced, and that prescription allocations are made.

In a linear programming analysis, constraints supersede the objective function. Thus, where a predetermined level of output, minimum physical condition, or allocation is entered as a constraint, it is always achieved (or no feasible solution is found). Output levels and other desired effects, entered as constraints, are implicitly assumed to contribute more to public benefits than their cost of production plus the foregone public benefits of any outputs or other effects they replace in the solution. For this reason, the interdisciplinary team tried to formulate constraints that met objectives with the lowest cost and least effect on other outputs. In most cases, this required the formulation and testing of several alternative sets of constraints to determine the most cost effective set (in terms of PNV that would meet the objectives).

Five different categories of constraints were used:

1.**Minimum Management Requirements (MMRs)** - These are constraints needed to meet MMRs or management standards. Procedures for defining the MMRs were specified by Region 5. MMRs are applied to all benchmarks and alternatives, but they are not applied to the unconstrained Maximum PNV assigned with Flow and Long-term Sustained Yield constraints (FLW) or the Minimum Level of Management (MLV) FORPLAN runs.

The MMRs are taken from 36CFR 219.27 and generally represent requirements that are outside of Forest Service authority to change. They are based on statutes and regulations in contrast to manual direction or agency policy.

2. **Minimum Implementation Requirements (MIRs)** - These are constraints needed to assure that alternatives are minimally acceptable and implementable on the ground. Procedures for defining MIRs were specified by Region 5. They are within agency control, but there is little discretionary control regarding their application at the Forest level. MIRs do not apply to benchmarks, but they are applied to all alternatives.

3. **Timber Policy Constraints** - These are needed to ensure that timber harvest meets sustained yield, rotation length, and dispersion requirements. These constraints are applied in all benchmarks and alternatives, except for the non-declining yield constraint.

4. **Forest Management Requirements (FMRs)** - These constraints are needed to assure implementability at the local level. They are based on local (rather than Regional) conditions and issues. These constraints are not applied to benchmarks, but are applied to all alternatives except the Constrained Economically Efficient (CEE) FORPLAN Alternative. Opportunity costs associated with these constraints were depicted in FORPLAN Alternative CEF.

5. **Forest Constraints That Vary Between Alternatives** - These constraints are unique to individual alternatives. They are applied to meet the theme of individual alternatives. Land base constraints caused most of the difference between the Shasta-Trinity National Forests' alternatives.

See the Economic Comparisons Section of Chapter II for a discussion of the opportunity costs associated with each of the above constraints.

I. Minimum Management Requirements (MMRs)

Included in the following discussion of the MMRs is the rationale of how they were modeled in FORPLAN. All MMRs were modeled either directly or indirectly. That is, in some cases a constraint was used in the model which was intended to recognize more than one MMR.

1. **Capable, Available, and Tentatively Suitable Timber Lands** - The following criteria were used in identifying tentatively suitable timber lands in the Forests' data base:

a. The land is forested and is producing or is capable of producing crops of industrial wood. This includes land which is occupied by at least 10 percent forest trees and/or land which has the biological growth potential of at least 20 cubic feet per acre per year.

b. The land has not been withdrawn from timber production by Congress, the Secretary of Agriculture, or the Chief of the Forest Service. On the Shasta-Trinity National Forests, the Castle Crags, Chanchelulla, Mt. Shasta, Trinity Alps, and Yolla Bolly-Middle Eel Wildernesses, as well as the Shasta Mud Flow Research Natural Area (RNA), have been withdrawn from timber production.

c. Technology and knowledge exists and is available to ensure that timber is produced without irreversible damage to soil productivity, water quality, or watershed condition. Lands which are most prone to sediment production through mass wasting, such as inner gorges and recently active landslides, are identified, and classified, as unsuitable.

d. Existing technology and knowledge, as reflected in current research and experience, provides reasonable assurance that adequate restocking can be attained within five years after final harvest.

e. Significant cultural resource sites have been removed from the suitable timber land base.

This MMR was modeled in FORPLAN by allocating cultural resource areas (2,000 acres), the Shasta Mud Flow RNA, existing Wilderness areas, non-forest, non-regenerable, non-capable, highly unstable areas, 600 foot corridor along the major inner gorge, and 300 foot corridor along the minor inner gorge as unsuitable (TM-UNS) for timber management.

2.**Threatened and Endangered (T&E) and Sensitive Species** - including the following:

a. Approved or current recovery, territory, and species management plans for population and habitat requirements were used.

b. A target population level was assigned as follows:

Bald eagle (35 pair) and
Peregrine falcon (14 pair).

c. Bald Eagle and Peregrine Falcon--

Population levels have been assigned by Region 5's Fish and Wildlife staff in conjunction with approved recovery plan requirements. Major active nesting areas would receive priority in management strategies.

This MMR was modeled in FORPLAN by allocating all currently identified and potential territories to TM-UNS. Most of these acres are within the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA).

d. Spotted Owl

All acres identified in the ISC report as Category I or II HCAs, plus the F&WS Critical Habitat, are modeled as TM-UNS. In addition, the allowable prescriptions on otherwise suitable land must comply with the 50-11-40 rule.

e. Direction for Sensitive Species

(1) A target population level was assigned as follows: Goshawk (150 pair).

(2) Goshawk

Within its habitat range, goshawk territories would be managed to maintain a density of at least one territory per 18 square miles. Distances between territories or clumps of territories should not exceed 12 miles. A total of about 150 territories is assumed as the minimum level for the Forests. About 75 territories are on lands classified as tentatively suitable for timber.

Each territory would contain a minimum of 100 acres of habitat. This provides suitable conditions for the nest stand and an alternate nest stand.

A total of about 15,000 acres is assumed to be the minimum acreage to be managed for goshawks on the Forests. About 5,000 acres are on suitable timber lands not otherwise constrained by MMRs.

Currently active nest territories take preference in delineation of a population network.

Timber management activities would be excluded within occupied nest stands during the nesting period. During other periods of time, these activities should be limited to those activities which meet the criteria outlined in this MMR and the habitat variables associated with suitable habitat in the Forests' goshawk habitat capability model.

f. Direction for Snag-Dependent Species.

To the extent possible, within each timber compartment an average of 1.5 snags per acre with the following specifications would be provided, maintained, and managed for:

(1) 1.2 snags per acre between 15-24 inches diameter at breast height (dbh) and greater than 20 feet high; and

(2) 0.3 snags per acre greater than 24 inches dbh and greater than 20 feet high.

This MMR was modeled in FORPLAN by foregoing the timber yields from every other thinning in regenerated stands.

3. Diversity of Plant and Animal Communities:

a. Diversity consists of richness, evenness, and pattern, each element of which is considered in the diversity MMR.

b. Diversity of plant and animal communities is achieved by providing a threshold level of vegetation types and seral stages found within the Shasta-Trinity National Forests.

c. Plant and animal communities would be managed so that diversity would be similar to that already existing on the Forests. Reductions in diversity may be prescribed only when needed to meet the overall multiple-use objectives of an alternative.

d. The MMR is to provide and maintain a minimum of 5 percent of each timber type/seral stage combination on the Forests as a whole. The total existing area in each type in forested lands was used as the base for this calculation.

e. Both suitable and unsuitable timber lands were used to meet the diversity requirements as long as habitat characteristics for management indicator species (MIS) were fully met.

f. Vegetative types and seral stages (total acres) would be distributed in proportion to their current acres in a given management area.

This MMR was modeled in FORPLAN by accounting for seven seral stages ranging from seed/saplings to older over-mature habitat for each decade. All seral stages achieved the 5 percent minimum requirement on a Forest-wide basis without additional constraints.

4. Riparian Area Management - Perennial Streams, Lakes, and Reservoirs

a. No practices or prescriptions that cause detrimental changes to water quality, aquatic flora and fauna, and hydrophytic vegetation would be applied to perennial riparian areas.

b. Emphasis would be given to riparian dependent resources. Other activities would be allowed to occur when compatible with dependent resources.

This MMR was incorporated in FORPLAN by allocating a 200 foot corridor along all perennial streams to minimal timber (TM-MRG).

5. Soils and Water

a. Soil and water resources would be conserved. No significant or permanent impairment of the productivity of the land would be allowed.

b. Existing or potential watershed conditions that would influence soil productivity, water yield, water pollution, or hazardous events, such as landslides and stream channel destabilization, would be evaluated.

The amount of land disturbance on sensitive watershed lands would be limited in order to avoid soil loss, activation of mass land failures, and degradation of water quality through sedimentation.

This MMR relates to cumulative watershed impacts and was modeled in FORPLAN by estimating ERAs. The Forest-wide ERAs are lower than the Forest-wide TOC constraint. Thus, no constraint was applied in the FORPLAN model. This occurs because dispersion and the 50-11-40 rule are more constraining than the TOC constraint (See timber policy constraints - dispersion).

6. Designated Wild, Scenic, and Recreation Rivers

a. These rivers are managed according to guidelines contained within the National Wild and Scenic Rivers Act. Management direction is focused on the maintenance and enhancement of these rivers for their recreation and scenic values.

b. Lands adjacent to wild segments of the Wild and Scenic Rivers System are unavailable for timber production. However, timber management activities can take place along the Scenic and Recreation River segments.

This MMR was modeled in FORPLAN by allocating 1/2 mile corridors along wild rivers to TM-UNS, scenic rivers to TM-MRG, and recreation rivers to TM-REG.

J. Minimum Implementation Requirements (MIRs)

Following is a listing of the MIRs, including a discussion of how they were modeled in FORPLAN. MIRs would be applied in the implementation of all alternatives.

1. Sensitive Plant Species

a. Sensitive plants would be managed to ensure that these species do not become threatened or endangered because of management actions.

b. Vegetation management practices would be planned to protect or enhance sensitive plant species.

The above can be met without constraining the FORPLAN model.

These MIRs were not modeled in FORPLAN. They would be met through standards and guidelines in the proposed Forest Plan and through project level design and location considerations.

2. Visual Quality

Foregrounds and middlegrounds of the following scenic corridor travel routes would be maintained to partial retention visual objectives: officially designated California State and County scenic highways and California State Scenic Highway system routes (as identified in the 1970 Master Plan).

a. The foreground portions (3/4 to 1 mile wide) and middleground portions (areas located from 1/4-1/2 to 3-5 miles from the viewer) of the following corridors would be managed to an adopted visual quality objective (VQO) of partial retention:

   (1) U.S. Highway 97;

   (2) State Highway 3;

   (3) State Highway 36 (from its junction with State Highway 3 westward to the National Forest boundary);

   (4) State Highway 89;

   (5) Interstate 5 (between U.S. Highway 97 and State Highway 89).

This MIR was modeled by allocating the foreground and middleground areas to TM-REG.

3. Clearcutting

No more than 18 percent of the total suitable acres available for even-aged management can be clearcut in any one time period. This constraint was never binding in any time period in any alternative.

K. Timber Policy Constraints

Listed below are the detailed descriptions of the constraints used in the FORPLAN model in response to sustained yield, harvest flow, rotation length, and dispersion requirements.

1. Rotation Length and Culmination of Mean Annual Increment Requirements for Timber Harvest Scheduling.

a. Mean annual increment was:

   (1) Based on regenerated yields;

   (2) Calculated for each applicable FORPLAN prescription; and

   (3) Determined for sawlog products measured in cubic feet.

b. For benchmarks and alternatives, minimum rotations were based on culmination of mean annual increment (CMAI) in utilized cubic feet of merchantable size trees. Regenerated timber stands are regarded as generally culminated in growth at the age that corresponds to 95 percent of the apparent culmination calculated from the managed yield projections used in FORPLAN. Culmination is always later than or equal to the age of merchantability.

c. On the Forests, the age at CMAI is equal to the age of merchantability on over 80 percent of the suitable timber lands. Therefore, rotation ages based on merchantability are the same as rotation ages based on CMAI for FORPLAN modeling purposes.

Merchantability occurs when the average projected dbh is 13 inches with an average projected tree height of 50 feet for stands maintained within the range of desired to optimum stocking. This is to insure that nearly all trees in the projected stand would be minimally merchantable and larger at first harvest.

The minimum age for attainment of 13-inch dbh., 50-feet height and 90 percent-BA MAX (for standard even-aged management) is shown in **Table B-8.**

The rotations included in FORPLAN matrices represent the range from culmination to the end of the planning horizon. This is for regenerated timber projected for harvest starting in any period that corresponds to a mean stratum age equal to that of culmination for regenerated stands. To the extent possible, each regeneration class in the FORPLAN matrix included one timing choice that corresponded to minimum CMAI defined for the class. The FORPLAN minimum rotation lengths are shown in **Table B-9.**

2. Sustained Yield Requirements

Table B-8
Minimum Age to Attain 13 inch, 50 foot Trees

Dunning Site	FORPLAN Period	Age
I & IA	4	35
II	5	45
III	6	55
IV	7	65
V	8	75
VI +	Generally stands in this site grow less than 20 cubic feet per acre per year. Therefore, generally these stands are not suitable for timber production.	

Table B-9
Minimum Rotations

Forest Type	Without Thinning 95% CMAI	With Thinning 95% CMAI
Mixed Conifer - Trinity NF	60 years	90 years
Mixed Conifer - Shasta NF	50 years	70 years
Douglas-fir	50 years	70 years
Red Fir	80 years	110 years
Ponderosa Pine	80 years	110 years
Lodgepole Pine	70 years	N/A

FORPLAN Modeling Rules. To ensure that the Forests can sustain the timber harvest level past the end of the planning horizon, a FORPLAN constraint was applied that states timber harvest cannot exceed 95 percent of the long term sustained yield in decade 15.

3. Harvest Flow Requirements.

FORPLAN Modeling Rules. Timber output after the first decade is not allowed to fluctuate more than 15 percent from the previous decade. This prevents wide fluctuations from one decade to the next. The 15 percent limit is based on the portion of the current timber sale quantity required to support an average sawmill.

When non-declining yield was not applied (in benchmarks and sensitivity analyses), a harvest flow constraint of plus or minus 15 percent was applied.

4. Dispersion

a. The intent of the dispersion rule is to prevent regeneration units, which are still "openings," from being adjacent to each other. The intent is also to disperse units in such a way as to leave logical harvest units between openings for future management. This requirement applies only to regeneration harvest based on even-aged management. An opening created by even-aged timber management would no longer be considered an opening once the number of trees, (See **Table B-10**), has reached 4.5 feet in height and the trees are generally free to grow.

b. *FORPLAN Modeling Rules.* The dispersion requirement is modeled in FORPLAN by limiting the number of acres which can be altered in any one decade. Separate constraints were used for each Forest and for each of the major forest types with significant acreages. The constraint for managed timber lands (TM-REG) was a harvest limit of not more than 34 percent of the acres in any two consecutive decades for decade 1; 32 percent for decade 2; 30 percent for decades 3 and 4; and 28 percent for decades 5-16. Also, a harvest limit of not more than 23 percent of the first decade timber inventory for decades 1-4 and 24 percent for decades 5-16 was imposed. See planning record Dispersion of Timber Harvest for more information.

Table B-10
Dispersion

Forest Type	Site Class	Minimum Number of Trees per Acre
Ponderosa Pine	I	150
	II	125
	III	100
	IV	75
Red & White Fir	All	200
Douglas-fir	All	125
Mixed Connifer	All	150

L. Additional Forest Direction and Constraints

Personnel of the Shasta-Trinity National Forests have added a minimal number of constraints to the MMRs and MIRs already listed. The purposes of these constraints are twofold: to supplement, further interpret, and define the generalized direction in Region 5's MMRs; and to more completely respond to local Forest issues.

1. Forest Supplementation of Regional MMRs.

Additional Forest direction and interpretations of Region 5's MMRs have not been modeled and are not considered additive to the MMRs. These supplementary directions are embedded in the Forest-wide standards and guidelines. Refer to the proposed Forest Plan.

2. Forest Management Requirements (FMRs)

a. *Whiskeytown-Shasta-Trinity National Recreation Area (NRA).* The Shasta and Trinity Units of the NRA are included under all alternatives considered. However, a variety of resource activities are allowed under the NRA regulations as long as they are compatible with the recreation purpose of the area.

This constraint was applied to all alternatives considered in detail because of the National importance of the area for public outdoor recreation. These values have been recognized by Congress through the Whiskeytown-Shasta-Trinity National Recreation Area Act (Public Law 89-336, November 8, 1965), and related regulations (36 CFR 251.4).

This constraint is modeled in FORPLAN by allocating the Shasta Unit to TM-UNS; the foreground viewing area of the Trinity Unit to TM-MRG; and the middleground of the Trinity Unit to TM-REG.

b. *Visual resource management direction* is also provided for major travel corridors and viewsheds not included as MIRs. The foreground portions of three corridors were identified to be managed to a visual partial retention standard: (1) State Highway 299; (2) portions of Interstate 5 not identified in the 1970 California State Scenic Highway Master Plan for scenic highway designation; and (3) portions of Highway 36.

The Interstate 5 corridor south of State Highway 89 and Highway 36 and east of Highway 3, are examples of Forest-level visual constraints not covered by an MIR.

This constraint is needed because these three corridors carry the majority of the viewing public which travel through the Forests. State Highway 299 is a major east-west travel corridor between Redding and the north coast of California. It is also adjacent to an existing Recreation River (mainstem Trinity River) in the National Wild and Scenic Rivers System.

Interstate 5 provides an important and scenically-sensitive link between Redding, the Shasta Unit of the NRA, the Sacramento River corridor, and Mt. Shasta.

Highway 36 provides important access through the scenically-sensitive southern part of the Trinity National Forest.

This requirement was modeled in FORPLAN by allocating the foreground viewing areas along portions of Interstate 5, Highway 36, and Highway 299 to TM-REG.

c. *Poorly Stocked Areas within Bitterbrush.* These areas are included in the modeling to fulfill a need to maintain and/or enhance a key browse species on deer summer range. More importantly, setting aside these areas is in response to the need to enhance production of livestock (in this case, sheep) to meet RPA goals and provide a sufficient forage base to meet deer summer range and sheep allotment needs.

This requirement was modeled in FORPLAN by allocating all poorly stocked bitterbrush areas to TM-UNS.

d. *Maintaining an Average of 30 Square Feet of Hardwoods* on wildlife and visual areas is necessary to maintain wildlife species dependent on this habitat (i.e. gray squirrels) and is compatible with the VQO of partial retention.

This requirement was modeled in FORPLAN by applying a 10 percent reduction in regenerated yields on the Trinity National Forest and a 5 percent reduction on the Shasta National Forest to prescription TM-REG.

e. *Developed Recreation and Administrative Sites were modeled* by allocating FORPLAN prescription TM-UNS for all alternatives.

f. *Special Interest Areas (SIAs).* Nine areas are proposed for SIA consideration (See **Table III-16**) for a listing of these areas). All of these areas involve unsuitable timber lands and/or caves which do not affect surface uses. These areas were not identified in FORPLAN as being suitable timber lands.

g. *Research Natural Areas (RNAs).* In addition to the already designated Shasta Mud Flow RNA, four areas are proposed for RNAs. These are Cedar Basin, Preacher Meadows, Red Butte-Red Fir Ridge, and Stuart Fork.

This requirement was modeled in FORPLAN by allocating the areas to TM-UNS.

h. *Riparian Areas Along Class 1, 2, and 3 Streams* The riparian standards, as described under Management Prescription IX in Chapter 4 of the Proposed Forest Plan, dictate how riparian areas will be managed in all alternatives. For modeling purposes the RMZ widths for Class I, II, and III streams were classified as unsuitable (TM-UNS).

M. Benchmarks

1. FLW - Maximum Present Net Value (PNV) with Flow and Long-Term Sustained Yield (LTSY) Constraints Benchmark

a. Description and Purpose:

(1) Used to evaluate the appropriateness of harvest flow constraints.

(2) Used to provide the economic efficient level of valued resources with fewest constraints.

(3) Forms a base run used in evaluating MMRs.

b. Specifications:

(1) Objective Function: Maximize PNV for 10 periods (decades).

(2) Timber Policies:

(a) Minimum rotation: Merchantability (same as the culmination of mean annual increment [CMAI]);

(b) Includes sustained yield requirements;

(c) Includes harvest flow requirements;

(d) No dispersion was included.

(3) Land Base: Includes all tentatively suitable lands.

(4) Economic Assumptions: Used assigned values with trends and demand cut-offs for RVDs.

2. H2O - Water Yield Maximization Benchmark

a. Description and Purpose: Used to define maximum capability of the Forests to provide water over the RPA planning horizon subject to MMRs.

b. Specifications:

(1) Objective Function: Maximize water yield (acre-feet) for five periods (decades).

(2) Timber Policies:

(a) Minimum rotation: Used the full set of rotation ages greater than or equal to 95 percent of CMAI;

(b) Includes sustained yield requirements;

(c) Includes nondeclining yield requirements;

(d) Includes dispersion.

(3) Land Base: Includes all tentatively suitable land.

(4) Economic Assumptions: Used assigned values with trends and demand cut-offs for RVDs.

(5) All MMRs were applied.

(6) Activity Constraints: Water yield activities provided for:

(a) Type conversion to grass of selected chaparral lands not capable of growing 20 cubic feet of timber per acre per year. About 42,000 acres were included.

(b) Type conversion to grass of selected chaparral lands on suitable timber lands. About 25,000 acres were included.

(c) Intensive harvesting of timber lands to provide high levels of water yield.

(d) Vegetative treatments in noncommercial vegetation types.

(7) An economic rollover was performed to determine the most economically efficient allocation and schedule which corresponds to the water yield levels (acre-feet) for each of the first five periods as defined in the Maximum Water run.

The specifications for this rollover were as follows:

(a) Objective Function: Maximize PNV for 10 periods;

(b) Timber policies were the same as above;

(c) Land base was the same as above;

(d) Economic assumptions were the same as above;

(e) All regionally defined MMRs were applied as above;

(f) Output constraints: Meets the water yield outputs (acre-feet) for each of the first five periods as defined by the maximum water run;

(g) Activity constraints were the same as above.

3. MKV - Maximum PNV-Market Values Only Benchmark

a. Description and Purpose:

(1) Used to estimate the mix of resource uses and a schedule of outputs and costs which would maximize the PNV of those outputs that have an established market price. Dollar values were based on actual or simulated market prices (willingness to pay) for timber, range, commercially used fish, and developed recreation. Used the same dollar values as other runs.

(2) Outputs were compared to Maximum PNV assigned with the MMR run to provide proportional differences in PNV and outputs. Proportions were used to estimate the differences between assigned and market values in subsequent runs.

b. Specifications:

(1) Same as Maximum PNV assigned with MMR run except used market values only (timber, range, developed recreation, and commercial fish).

(2) The solution was run through the FORPLAN report writer to price out all assigned values. The PNV-COST values from the second report were used to make comparisons.

4. MLV - Minimum Level of Management Benchmark

a. Description and Purpose: Used to estimate outputs and cost of the backgrounds or residuals. Minimum level is an accounting analysis to determine the background outputs and fixed costs associated with maintaining the Forests. It was used as a base to compare other alternatives. It is not stewardship or custodial management.

b. Specifications:

(1) Objective Function: Minimize cost for the planning horizon (16 decades).

(2) Output Constraints:

(a) Only background or incidental outputs were allowed;

(b) Timber, range, and developed recreation outputs were set at zero.

c. Other Assumptions:

(1) Vegetation would follow natural succession. Habitat capability for MIS requiring late seral stage habitat would increase over time. Habitat capability for indicator species requiring early seral stage habitat would decrease over time.

(2) Only maintenance of those facilities that are needed to support the basic ownership activities would be allowed. All other facilities would be allowed to deteriorate.

(a) State and County roads would remain open but most Forest roads would be closed.

(b) All public and private sector recreation facilities on National Forest lands would be closed, with no provisions for maintaining such assets.

(3) The fire organization would be greatly reduced. Forests would assume costs for detection and initial attack (engines) only; no other fire management and/or cooperator resources were considered.

(4) Recreation use assumptions - Dispersed recreation use that cannot be discouraged or controlled would occur.

5. MMR - Minimum Management Requirements Benchmark

a. Description and Purpose:

(1) Used to define and evaluate MMRs.

(2) Used to show the opportunity cost of MMRs taken collectively.

(3) Used to form the basis for evaluating constraints.

(4) Used to estimate the mix of resource uses and a schedule of outputs and costs which would maximize the PNV of those outputs that are assigned a monetary value. Dollar values were based on actual or simulated market prices (willingness to pay) for timber, recreation, range, water, wildlife, and fish.

b. Specifications:

(1) Objective Function: Maximum PNV for 12 periods (decades).

(2) Timber Policies:

(a) Minimum rotation: Used the full set of rotation ages greater than or equal to 95 percent of CMAI;

(b) Includes sustained yield requirements;

(c) Includes nondeclining yield requirements;

(d) Includes dispersion.

(3) Land Base: Includes all tentatively suitable land.

(4) Economic Assumptions: Used assigned values with trends and demand cut-offs for RVDs.

(5) All MMRs were applied.

6. RGN - Range Maximization Benchmark

a. Description and Purpose: Used to define maximum capability of the Forests to provide commercial livestock grazing over the RPA planning horizon subject to MMRs.

b. Specifications:

(1) Objective Function: Maximum livestock forage for five periods (decades).

(2) Timber Policies:

(a) Minimum rotation: Used the full set of rotation ages greater than or equal to 95 percent of CMAI;

(b) Includes sustained yield requirements;

(c) Includes nondeclining yield requirements;

(d) Includes dispersion.

(3) Land Base: Includes all tentatively suitable land.

(4) Economic Assumptions: Used assigned values with trends and demand cut-offs for RVDs.

(5) All MMRs were applied.

(6) Activity Constraints: The range activities provided for:

(a) Type conversion to grass of selected chaparral lands not capable of growing 20 cubic feet of timber per acre per year. About 42,000 acres were included.

(b) Type conversion to grass of selected chaparral lands on suitable timber lands. About 25,000 acres were included.

(c) Full development of water, fencing, etc., to permit full utilization of available forage.

(d) Grazing in wilderness.

(e) Intensive harvesting of timber lands to provide high levels of transitory range.

(7) An economic rollover was performed to determine the most economically efficient allocation and schedule which corresponded to the forage production levels animal months (AMs) for each of the first five periods as defined in the Maximum RGN run.

The specifications for this rollover were as follows:

(a) Objective Function: Maximum PNV for 10 periods;

(b) Timber policies were the same as above;

(c) Land base was the same as above;

(d) Economic assumptions were the same as above;

(e) All MMRs were applied as above;

(f) Output constraints: Meets the forage outputs (AMs) for each of the first five periods as defined by the Maximum RGN (14RGN) run;

(g) Activity constraints were the same as above.

7. TBD - Maximize Timber Outputs for One Decade-Departure Benchmark

a. Description and Purpose: Used to define the maximum timber output possible for the first decade with nondeclining yield policy removed and CMAI and MMRs retained.

b. Specifications:

(1) Same as TBR run below, except for removal of nondeclining yield (NDY).

(2) Land Base: Includes all tentatively suitable land.

(3) Economic Assumptions: Same as TBR.

(4) All MMRs were applied.

(5) An economic rollover was performed as was the case for TBR. Rollover specifications were the same as TBR.

8. TBR - Maximize Timber Outputs Benchmark

a. Description and Purpose: Used to define the maximum timber output possible for the first decade under current policy and MMRs.

b. Specifications:

(1) Objective Function: Maximum timber for one period (decade).

(2) Timber Policies:

(a) Minimum rotation: Used the full set of rotation ages greater than or equal to 95 percent of CMAI;

(b) Includes sustained yield requirements;

(c) Includes nondeclining yield requirements;

(d) Includes dispersion.

(3) Land Base: Includes all tentatively suitable land.

(4) Economic Assumptions: Used assigned values with trends and demand cut-offs for RVDs.

(5) All MMRs were applied.

(6) An economic rollover was performed to determine the most economically efficient allocation and schedule which corresponded to the harvest levels for each of the five periods defined in the maximum timber run.

The specifications for this rollover were as follows:

(a) Objective Function: Maximize PNV for 10 periods;

(b) Timber policies were the same as above;

(c) Land base was the same as above;

(d) Economic assumptions were the same as above;

(e) All MMRs were applied as above;

(f) Output Constraint: Meet timber outputs from each of the five periods as defined by the maximum timber run.

9. WLN - Maximum Wilderness Benchmark

a. Description and Purpose: Used to evaluate the impacts of maximum wilderness allocations.

b. Specifications:

(1) Objective Function: Maximize PNV for 10 periods.

(2) Timber Policies:

(a) Minimum rotation: Used the full set of rotation ages greater than or equal to 95 percent of CMAI;

(b) Includes sustained yield requirements;

(c) Includes nondeclining yield requirements;

(d) Includes dispersion.

(3) Land Base:

(a) Includes all tentatively suitable lands.

(b) All roadless areas designated for further planning were allocated to wilderness prescription. Boundary adjustments were not allowed. The Mt. Eddy Further Planning area was included.

(4) Economic Assumptions: Used assigned values with trends and demand cut-offs for RVDs.

(5) All MMRs were applied.

N. Alternatives

This section lists only those constraints that were modeled in FORPLAN; it also describes how they were modeled. For a more complete discussion about the displays and results of all the alternatives refer to Chapter II. Chapter II lists all constraints unique to an alternative and Chapter IV discusses how those constraints change the environmental consequences.

Alternatives Eliminated From Detailed Study

1. Alternative CEE - Constrained Economically Efficient Alternative

a. Description and Purpose:

(1) Used to portray the most economically efficient mix of allocations and schedules, subject to meeting MMRs and MIRs.

(2) Used to specifically define and evaluate MIRs.

(3) Used to demonstrate the opportunity cost of the MIRs taken collectively.

(4) Used to form a base run used in evaluating the Forests' constraints common to all alternatives.

b. Specifications:

(1) Objective Function: Maximize PNV for 12 periods (decades).

(2) Timber Policies:

(a) Minimum rotation: Used the full set of rotation ages greater than or equal to 95 percent of CMAI;

(b) Includes sustained yield requirements;

(c) Includes nondeclining yield requirements;

(d) Includes dispersion.

(3) All MMRs and MIRs were applied. No additional Forest defined constraints were added.

(4) Land Base: Includes all tentatively suitable land.

(5) Economic Assumptions: Used assigned values with trends and demand cut-offs for RVDs.

2. Alternative CEF - Constrained Economically Efficient Alternative with Forest Constraints

a. Description and Purpose:

(1) Used to portray the most economically efficient allocation and schedule, subject to meeting MMRs, MIRs, and Forest constraints common to all alternatives.

(2) Used to specifically define and evaluate the Forests' constraints common to all alternatives.

(3) Used to demonstrate the opportunity costs of the Forests' constraints common to all alternatives taken collectively.

(4) Used to form a base run used in evaluating other constraints and the Forests' alternatives.

b. Specifications:

Same as Alternative CEE except: In addition to the MMRs and MIRs, the Forests' constraints common to all alternatives are included in this alternative.

3. Alternative LBU - 25 Percent Budget Reduction

a. Description and Purpose: Used to estimate the expected outputs and services that could be provided in the future if the current budget was reduced by 25 percent.

b. Assumptions:

(1) Held as constant for the 50-year planning horizon, a 25 percent reduction in the normalized 1989 budget (see Alternative CUR direction). This 25 percent reduction is applied to the total dollars.

c. Specifications:

(1) Objective Function: Maximum PNV for 12 periods (decades).

(2) Timber Policies:

(a) Minimum rotation: Used the full set of rotation ages greater than or equal to 95 percent of CMAI;

(b) Includes sustained yield requirements;

(c) Includes nondeclining yield requirements;

(d) Includes dispersion.

(3) Land Base: Includes all tentatively suitable land.

(4) Economic Assumptions: Used assigned values with trends and demand cut-offs for RVDs.

(5) All MMRs and MIRs were applied. The Forests' constraints common to all alternatives were also applied.

4. Alternative MKT - Market Emphasis

Description and Purpose: This alternative emphasizes high output levels of market resources such as timber, range, and minerals with non-market outputs at economically efficient levels.

This required alternative is not measurably different from RPA, therefore, it was not run. See alternatives considered in detail section, specifically alternative RPA.

5. Alternative PFD - Preferred Alternative/Departure

a. Description and Purpose: Used to determine whether multiple-use objectives could be better met by regulating timber harvest volumes in a manner which deviates from the principle of Nondeclining Yield (NDY).

b. Specifications: Same specifications as Alternative PRF (Preferred Alternative) except for the following:

(1) Objective Function: Maximize PNV for 12 decades.

(2) Nondeclining Yield: Applied only after the fifth decade.

(3) Required to return to the Base Sale Schedule of Alternative PRF by the fifth decade.

6. Alternative 12C - Late Successional Forest Management

a. Description and Purpose: This alternative emphasizes the protection of Old Growth reserves and watershed/fishery habitats as defined by the Scientific Panel on Late-Successional Forest Ecosystems.

b. Specifications:

(1) All specifications of the Preferred Alternative are applied to Alternative 12C.

(2) In addition, old growth reserve categories 1 and 2 and owl additions are classified unsuitable.

(3) The following constraints of the enhanced watershed/fishery habitat emphasis are included:

(a) Intermittent streams: 50-feet on each side with no harvest on moderate to high instability sites;

(b) Class 3 streams (no fish bearing) 150-feet;

(c) Class 1 & 2 streams (fish bearing) 300-feet on each side dedicated plus major corridors or flood plains 1/8-mile dedicated on each side;

(d) Wild and Scenic Rivers 1/4-mile dedicated on each side;

(e) On non HCAs and Old Growth Reserve areas, preserve 6-green trees greater than the average stand diameter for future snags and dead and down;

(f) No hot burns on steep areas and no burning in riparian areas; and

(g) Critical watersheds are managed under an extended rotation of 180 years on all suitable timber acres.

Alternatives Considered In Detail

1. Alternative PRF - Preferred Alternative

a. Description and Purpose: Alternative PRF portrays the Forests as being capable of supporting a sustained yield of commodity outputs, goods, and services. Resources are intensively managed within at least the minimum requirements of multiple-use forest management. Alternative PRF emphasizes a mixture of commodity production and amenity benefits that optimizes net public benefits (NPBs) while responding to local Forest issues.

b. Specifications:

(1) All MMRs, MIRs, and Forest constraints common to all alternatives were applied to this alternative.

(2) The following timber policies were applied:

(a) Sustained yield requirements;

(b) Harvest flow requirements;

(c) Nondeclining yield;

(d) Dispersion rules; and

(e) Minimum rotations.

(3) The objective function was to maximize PNV for 100 years (10 10-year periods).

(4) Constraints unique to this alternative: Several allocations of land were made under this alternative beyond the MMRs, MIRs, and common Forest constraints in order to respond to local Forest issues.

- Allocations of specified analysis areas to timber unsuitable (TM-UNS) prescriptions, over and above MMRs, MIRs, and forest constraints, include primarily the following areas:

  (1) portions of 5 roadless areas to semi-primitive non-motorized;

  (2) rural recreation on dispersed recreation sites, existing and potential ski areas, summer homes and special uses;

  (3) 6 RNAs; and

  (4) nonstocked lands (i.e. brush, hardwoods, and knobcone pine).

- Allocations of specified analysis areas to minimal timber (TM-MRG) prescriptions include primarily the following areas:

  (1) foreground viewing areas from developed recreation sites;

  (2) foreground viewing areas along scenic highways (Interstate 5 and Highways 3, 36, 89, 97, and 299 and the Everitt Memorial Highway;) and

  (3) moderately unstable lands.

A total of 102,240 acres of tentatively suitable timber lands was allocated.

- Allocations of specified analysis areas to timber (TM-REG) prescriptions include primarily the following areas: all other tentatively unsuitable land.

A total of 473,048 acres of tentatively suitable timber lands was allocated.

The net effect of all these allocations on the prescriptions in the Alternative PRF land base, when compared to Alternative RPA, was as follows:

TM-REG - Decreased by 64,688 acres from RPA.

TM-MRG - Increased by 1,860 acres from RPA.

Total tentatively suitable acres reduced by 62,828 as compared to RPA.

(a) No regeneration in deficit quarter townships according to the 50-11-40 rule. Thinning is permitted on any quarter township on areas meeting 11-40. Rotations are at a minimum of 90 years and average 120 years.

(b) The budget level for fire would increase by 100 percent above 1989 levels;

(c) Fifty percent of the dispersed, developed, and wilderness visitor days would be at low standard and 50 percent at high standard;

(d) Some use of herbicides would be allowed.

2. Alternative RPA - 1990 RPA Program Emphasis

a. Description and Purpose: Under Alternative RPA, the primary objective is to schedule and harvest timber and to provide products and services at levels expected to help satisfy current and future demands (as stated in the 1990 Forest and Rangeland Renewable Resources Planning Act [RPA] program). This alternative determines how the Forests' RPA program can best be implemented.

b. Specifications:

(1) All MMRs, MIRs, and Forest constraints common to all alternatives were applied to this alternative.

(2) The following timber policies were applied:

(a) Sustained yield requirements;

(b) Harvest flow requirements;

(c) Nondeclining yield;

(d) Dispersion rules; and

(e) Minimum rotations.

(3) The objective function was to maximize PNV for 100 years (10 10-year periods).

(4) Constraints unique to this alternative: Only a few allocations of land were made under this alternative beyond the MMRs, MIRs, and common Forest constraints:

- Allocations of specified analysis areas to timber unsuitable (TM-UNS) prescriptions, over and above MMRs, MIRs, and Forest constraints, include primarily the following areas:

  (1) Rural recreation on dispersed recreation sites;

  (2) one RNA;

  (3) nonstocked lands (i.e. brush, hardwoods, and knobcone pine).

- Allocations of specified analysis areas to minimal timber (TM-MRG) prescriptions include primarily the following areas:

  (1) foreground viewing areas from developed recreation sites;

  (2) foreground viewing areas along scenic highways (Interstate 5 and Highways 3, 36, 89, 97, and 299 and the Everitt Memorial Highway;) and

  (3) moderately unstable lands.

A total of about 100,380 acres of tentatively suitable timber lands was allocated to this prescription.

- Allocations of specified analysis areas to timber (TM-REG) prescriptions include primarily the following areas: all other tentatively suitable lands.

A total of 538,736 acres of tentatively suitable timber lands was allocated.

(a) No regeneration cutting can occur in deficit quarter townships according to the 50-11-40 rule. Thinning is permitted in all quarter townships on every acre meeting 11-40. Rotations are at a minimum of 90 years.

(b) The budget level for fire would increase by 100 percent above 1989 levels.

(c) Twenty-five percent of the dispersed, 70 percent of the developed, and 40 percent of the wilderness visitor days would be at low standard and the remaining visitor days at high standard.

(d) Some use of herbicides would be allowed.

3. Alternative CUR - No Action/No Change

a. Description and Purpose: Alternative CUR is the No Action/No Change Alternative required by National Forest Management Act (NFMA) regulations. This alternative represents a continuation of the current resource management direction based on Ranger District Multiple-Use Plans.

b. Specifications:

(1) All MMRs, MIRs, and Forest constraints common to all alternatives were applied to this alternative.

(2) The following timber policies were applied:

(a) Sustained yield requirements;

(b) Harvest flow requirements;

(c) Nondeclining yield;

(d) Dispersion rules; and

(e) Minimum rotations.

(3) The objective function was to maximize PNV for 100 years (10 10-year periods).

(4) Constraints unique to this alternative: Several allocations of land were made under this alternative beyond the MMRs, MIRs, and common Forest constraints:

- Allocations of specified analysis areas to timber unsuitable (TM-UNS) prescriptions, over and above MMRs, MIRs, and forest constraints, include primarily the following areas:

  (1) Rural recreation on dispersed recreation sites, existing ski areas, summer homes and special uses; and

  (2) nonstocked lands (i.e. brush, hardwoods, and knobcone pine).

- Allocations of specified analysis areas to minimal timber (TM-MRG) prescriptions include primarily the following areas:

  (1) foreground viewing areas from developed recreation sites;

  (2) foreground viewing areas along scenic highways (Interstate 5, Highways 3, 36, 89, 97, 299, and 24 Forest roads;) and

  (3) moderately unstable lands.

A total of 133,011 acres of tentatively suitable timber lands was allocated.

- Allocations of specified analysis areas to timber (TM-REG) prescriptions include primarily the following areas: all other tentatively suitable lands.

A total of 502,788 acres of tentatively suitable timber lands was allocated.

The net effect of all these allocations on the prescriptions in the Alternative CUR land base, when compared to Alternative RPA, was as follows:

TM-REG - Decreased by 35,948 acres from RPA.
TM-MRG - Increased by 32,631 acres from RPA.

Total tentatively suitable acres reduced by 2,317 as compared to RPA.

(a) No regeneration cutting is allowed in quarter townships not meeting the 50-11-40 rule. Thinning is permitted in all quarter townships on all

acres meeting 11-40. Rotations are at a minimum of 90 years;

(b) The budget level for fire would be at current levels;

(c) One-hundred percent of the dispersed, 80 percent of the developed, and 100 percent of the wilderness visitor days would be at low standard and the remaining visitor days at high standard;

(d) Some use of herbicides would be allowed.

5. Alternative CBF - Citizens for Better Forestry

a. Description and Purpose: Alternative CBF strikes a balance between resource use and resource restoration. This alternative emphasizes protection of RMZs, maintaining roadless areas in an undeveloped condition, maintaining older over-mature habitat, and emphasizing harvest systems other than clearcutting.

b. Specifications:

(1) All MMRs, MIRs, and Forest constraints common to all alternatives were applied to this alternative.

(2) The following timber policies were applied:

(a) Sustained yield requirements;

(b) Harvest flow requirements;

(c) Nondeclining yield;

(d) Dispersion rules; and

(e) Minimum rotations.

(3) The objective function was to maximize PNV for 120 years (12 10-year periods).

(4) Constraints unique to this alternative: Several allocations of land were made under this alternative beyond the MMRs, MIRs, and common Forest constraints:

- Allocations of specified analysis areas to timber unsuitable (TM-UNS) prescriptions include primarily the following areas:

(1) 16 roadless areas to semi-primitive nonmotorized;

(2) Mt Eddy roadless area to wilderness;

(3) Mt. Shasta Scenic Area (Area A);

(4) rural recreation on dispersed recreation sites, existing ski areas, summer homes and special uses;

(5) 17 RNAs;

(6) total RMZ width between 300 and 1,200 feet depending on slope, erosion hazard, and spotted owl corridors for perennial streams;

(7) Trinity Divide Biolink; and

(8) nonstocked lands (i.e. brush, hardwoods, and knobcone pine).

- Allocations of specified analysis areas to minimal timber (TM-MRG) prescriptions include primarily the following areas:

(1) Foreground viewing areas from developed and dispersed recreation sites;

(2) foreground viewing areas along scenic highways (Interstate 5, Highways 97 and 299, Everitt Memorial Highway, and 5 Forest roads;)

(3) moderately unstable lands;

(4) Mt. Shasta Recreation Area;

(5) N lands high site south and west aspect; and

(6) A lands low site poorly stocked.

A total of 122,666 acres of tentatively suitable timber lands was allocated.

- Allocations of specified analysis areas to (TM-REG) prescriptions include primarily the following areas: all other tentatively suitable lands.

A total of 372,750 acres of tentatively suitable timber lands was allocated.

The net effect of all these allocations on the prescriptions in the Alternative PRF land base, when compared to Alternative RPA, was as follows:

TM-REG - Decreased by 165,986 acres from RPA.
TM-MRG - Increased by 22,286 acres from RPA.

Total tentatively suitable acres reduced by 142,700 as compared to RPA.

(a) No regeneration cutting in deficit quarter townships according to the 50-11-40 rule. Thinning is permitted in all quarter townships on all acres meeting 11-40. Rotations are set at a minimum of 120 years. The regeneration system allowed is green tree retention (GTR). No clearcutting is permitted.

(b) The budget level for fire would increase by 100 percent above current levels.

(c) Fifty percent of the dispersed, developed, and wilderness visitor days would be at low standard and 50 percent at high standard.

(d) No use of herbicides would be allowed.

O. Summary of Constraints Modeled in FORPLAN

The major types of constraints that were modeled in FORPLAN are summarized for each alternative in **Table B-11**.

III. Other Models

In addition to FORPLAN, several other systematic models were used by the Shasta-Trinity National Forests. These are described below.

A. Fireplan

The fire management analysis process is comprised of four levels of analysis and a series of eight computer programs. Of the four levels of analysis only two (described below) are used in the Forest planning process; the other two levels affect implementation and evaluation. The eight computer programs are simulators and report writers used to define the historical and current fire management situations and to evaluate candidate fire management fuels, prevention, detection, and suppression programs. For a complete description of the fire management analysis process, see Forest Service Handbook (FSH) 5109.19 (National Fire Management Planning and Analysis Handbook).

1.Fire Management Analysis Level I is basically an analysis of the historical and current fire management situation using fire and weather information, records of fire occurrences, and fire behavior (number of fires, acres burned by fire, size, and intensity). Following are several uses of Level I analysis:

a. To display the general effectiveness and cost, including fighting forest fires (FFF), of the current fire management program. This program cost may be used as a basis for estimating expected future costs where the fire program is relatively stable and will not vary significantly between prescriptions on a Forest-wide basis.

b. As a tool to aid in the formulation and development of organizations in response to Forest Plan alternatives and prescriptions. Level I analysis identifies areas which can be further analyzed in the areas of prevention, suppression, and fuels management areas.

2. Fire Management Analysis Level II is an analysis of various fire management program options (a suppression mix versus prevention), budget levels (costs), and their effectiveness. This analysis is based upon the simulation of representative fires using varying fuel models, differing suppression resources, historical occurrence patterns, and by changing occurrence patterns based upon prevention efficiency. Following are several uses of Level II analysis:

a. To evaluate fire program options appropriate for the principal Forest Plan alternatives identified by FORPLAN; and to provide detailed resource output, value change, and program cost data for selection of the most efficient program level where fire program cost and effectiveness will affect the choice between these alternatives.

b. To evaluate the efficiency of fire program options for a number of alternative management prescriptions or Forest Plan alternatives and to provide general estimates of fire program cost and consequences for FORPLAN.

c. To evaluate the effectiveness of fire program options for a single Forest Plan alternative within a constrained budget and to establish the most effective program mix where the budget level is fixed.

From Fire Management Analysis Levels I and II, inputs by alternative to FORPLAN include:

a. Probability of acres burned;

b. Suppression costs reflecting the fire management organizational efficiency.

FORPLAN then determines the following by alternative:

a. Suppression costs;

b. Net value change for resources.

B. Regional Industrial Multiplier System (RIMS)

The U.S. Department of Commerce's RIMS was used to develop impact multipliers and employment and income estimates for the alternatives analyzed in this Draft EIS. This system provides input-output model multipliers for 56 industrial sectors for Bureau of Economic Analysis (BEA) Economic Area 169. Most of the economic activity associated with the Shasta-Trinity National Forests takes place within BEA Economic Areas 169 and 170. BEA Economic Area 169 includes the northeastern California area while Area 170 includes the north coast California area.

Table B-11
Constraints Imposed on Alternatives Considered in Detail

Modeling Feature	PRF	RPA	CUR	CBF
Objective Function	MAX PNV	MAX PNV	MAX PNV	MAX PNV
NDY*	Yes	Yes	Yes	Yes
Budget Constraint	No	No	No	No
3.3% Mortality	Yes	Yes	Yes	Yes
Unsuitable Lands	Yes	Yes	Yes	Yes
Herbicides	Yes	Yes	Yes	No
Riparian Mgt. Zones (minimum total width feet) (allocation)**				
Perennial Streams				
Class 1 Streams	600 TM-UNS	600 TM-UNS	600 TM-UNS	600 TM-UNS
Class 2 Streams	600 TM-UNS	600 TM-UNS	600 TM-UNS	600 TM-UNS
Class 3 Streams	300 TM-UNS	300 TM-UNS	300 TM-UNS	300 TM-UNS
Intermittent Streams				
Class 4 Streams	200 TM-REG	200 TM-REG	200 TM-REG	200 TM-REG
Lakes, Ponds, Reservoirs, and Wetlands				
Greater than One Acre	300 TMS-UNS	300 TMS-UNS	300 TMS-UNS	300 TMS-UNS
Less than One Acre	200 TMS-REG	200 TMS-REG	200 TMS-REG	200 TMS-REG
Goshawks	3000 TMS-UNS	3000 TMS-UNS	3000 TMS-UNS	7500 TMS-UNS
Fire Program (percent)				
Budget Level	+100	+100	CURRENT	+100
Recreation Program (percent)				
Dispersed/low standard	50	25	100	50
Dispersed/high standard	50	75	0	50
Developed/low standard	50	70	80	50
Developed/high standard	50	30	20	50
Wilderness (percent)				
Low Standard	50	40	100	50
High Standard	50	60	0	50
Management Intensity				
Minimum Rotation Regeneration in Deficit	90	90	90	120
Quarter Townships (50-11-40)	No	No	No	No
Thinning on All Acres That meet 11-40	Yes	Yes	Yes	Yes
Prescription (Acres)				
TM-MRG	102,240	100,380	133,011	122,666
TM-REG < 40%	213,413	234,983	216,274	160,452
TM-REG > 40%	259,617	302,753	286,514	212,298

* NDY - Non-declining Yield
** Actual widths of RMZs are determined as specified under the Riparian Management Zone Standards and Guidelines (S&Gs). (See Chapter 4 of the Proposed Forest Plan for the complete set of S&Gs.)

Estimates of historical expenditures associated with the Forests' outputs and purchases from the local economy were used with the RIMS input-output model multipliers to develop impact multipliers. These impact multipliers were used to estimate employment and income effects of the alternatives.

A number of assumptions used in the input-output modeling technique must be kept in mind when interpreting the resulting income and employment estimates:

1. Historical transaction patterns associated with the Forests' outputs and purchases are assumed to hold true in the future.

2. Transaction patterns (production functions) for industries in the local economy are assumed to be similar to those in the national economy and to hold true in the future.

3. Income and employment impacts are assumed to occur in the same time period as the underlying changes in Forest outputs and purchases (no lagged effects are assumed).

As a result of these basic assumptions, employment and income effects estimated for the alternatives have relatively low reliability, in absolute terms, in future time periods. However, the income and employment estimates are reasonably accurate indicators of relative changes between the alternatives in the first decade.

C. Forest Plan Data Base

A new Forest Plan Data Base was developed in 1987. Sixty-thousand capability areas were defined based on land status, forest type, condition class, and National Forest group. Additional information was coded into each capability area to assess public issues, define analysis areas, and determine acres of suitable prescriptions by alternative. This data was loaded into a System 2K data base on a Univac mainframe at Fort Collins, Colorado.

In 1988 the Forest Plan Data Base was migrated from the Univac at Fort Collins to the Data General system in the Supervisor's Office. It currently resides in Oracle on the Data General. During 1990 the data base was updated to account for harvesting, planting, fires and land exchange as of January 1, 1990. As a result of these edits the data base currently contains 68,000 polygons. Additional labels have been created to help analyze issues pertaining to the northern Spotted Owl and older overmature habitat.

The following attributes were coded for each capability area:

Geographic Locators

Map Number
Capability Area Number (polygon number)
Net National Forest Acres (land status)
Forest
District
Compartment
Quarter township
Slope
Aspect

Cultural Resources

Cultural Sites

FORPLAN Analysis

FORPLAN Analysis Area
Harvest regulation class by alternative

Riparian Areas

Inner Gorge Distance
Inner Gorge Type
Intermittent Stream Distance
Perennial Stream Distance
Perennial Stream Type

Soils

Erosion Hazard
Geologic Stability

Special Areas

Research Natural Areas
Special Interest Areas

Threatened, Endangered, and Sensitive Species

Habitat Consevation Area (HCA)
Designated Conservation Area (DCA)
Critical Habitat Unit (CHU)
50-11-40
Quarter Township category for 50-11-40

Vegetation

Timber Productivity Class
Timber Suitability for Regeneration
Timber Strata (forest type and condition class)
Vegetation Type
Vegetation Size
Vegetation Density
Stand Record System number
Year Planted

Visual Quality

Visual Absorption Capability
Visual Distance Zone
Visual Variety Class
Visually Sensitive Features

Wilderness and Roadless Areas

Classified Areas
Roadless Areas

Wildlife

Big Game Habitat

See the planning record data base dictionary for Land Management Planning, June 1992, for more information about these attributes.

D. Geographic Information System (GIS)

The 60,000 capability areas (polygons) were mapped in DWRIS87 (Distributed Wildland Resource Information System) a U.S. Forest Service, Region 5, GIS product. This system resides on the Data General computer at the Supervisor's Office. The Forests' set of digital maps, organized into the 119 quarter quads of the Forests, are linked to the Forest Plan Data Base to allow for area calculations and query mapping. The GIS was used to make timber suitability maps and calculate management prescription acres. It is also used regularly to overlay a variety of wildlife boundaries with the planning base maps to code polygons with new wildlife information and recalculate harvest regulation classes for alternatives.

E. Wildlife and Fish Habitat Relationships - Habitat Capability Models

The Wildlife and Fish Habitat Relationships System (WFHR) displays needs and/or habitat attributes of all known species which occur within a given geographical area or zone for breeding, feeding, nesting and season of use by major habitat types and seral stages of those types. This information is shown on a series of matrixes. The Shasta-Trinity National Forests' WFHR option includes the North Coast-Cascades Zone but does not include information for fish species.

From the WFHR system a specific set of habitat capability models was developed for each of the Management Indicator Species (MIS) to display a classification of habitat attributes for preferred, moderate, and low levels of management. These models represent an aggregation of information from several sets of existing species capability models.

In addition to the matrixes, the system includes range maps, pertinent life history narratives, scientific names, known habitat information, and references for information sources. This data base can be used to predict or provide species responses to habitat alteration, similar habitat use by more than one species, and habitat management needs.

F. Effective Alteration (EFFALT) Modeling

The EFFALT cumulative impact thresholds are applied in FORPLAN to limit timber harvesting activities and thereby assure that landscape alterations do not exceed the levels associated with desired visual quality objectives (VQOs). Perspective plot computer simulations were the primary tool employed to establish these thresholds in the EFFALT approach. These simulations were developed (chiefly on Hewitt-Packard HP9845 hardware) by Forest Service landscape architects. The most critical and common situations modeled were middleground landscapes with partial retention VQOs. Topographic and timber stand data was fed into the computer to simulate current conditions. Varying rotation lengths and harvest entry rates were then tested by modeling all units into the perspective plots.

The resulting simulations of altered landscapes were then examined visually to determine maximum limits of alteration permissible under the given VQOs. Thus, the actual correlations of harvesting rates and total EFFALT to VQOs were based on the landscape architects' professional judgment. For similar situations, these judgments were highly consistent. They were further corroborated by field inspection and aerial photos compared to existing visual conditions (EVC) mapping.

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5. Forest Service Manual (FSM) 2472.03, R-5 Supplement No. 232, May 1980.

6. U.S. Department of Commerce, Bureau of Economic Analysis, Industry - Specific Gross Output Multipliers for BEA Economics Areas, January 1977.

APPENDIX C

Roadless Area Descriptions and Evaluations

APPENDIX C
Roadless Area Descriptions and Evaluations

The purposes of this appendix are to: (1) summarize the findings used in the evaluation of the Mt. Eddy Further Planning Area (RARE II #05229) for wilderness or non-wilderness allocations; and (2) disclose the proposed disposition for 29 roadless areas released by the 1984 California Wilderness Act.

I. Findings and Analysis, Mt. Eddy Further Planning Area (RARE II-#05229)

Wilderness Resource Values

A

Description

The Mt. Eddy area totals 9,846 acres, 2,126 of which are in private ownership. It is located on the Mt. Shasta Ranger District about seven miles west of Mt. Shasta City. It is located on the main divide between the Sacramento and Trinity River watersheds.

The area is characterized by highly varied terrain ranging from level benches to nearly vertical slopes. Elevations range from 6,000 to 9,000 feet.

Vegetative types include grassy meadows, riparian zones, mixed conifer sawtimber, brushfields and subalpine tree species. The area contains the Sierran Forest Province-Mixed Conifer Forest ecosystem (M2610-5).

A number of alpine lakes are found within the area: Dobkins Lake, Durney Lake, Little Crater Lake, and Deadfall Lakes. These and other unpolluted water sources are of a high quality.

Evidence of past mineral development is present. Several prospecting sites for asbestos and chromite development are located within this area.

Recreation use (about 9,600 recreation visitor days [RVDs] annually) includes hiking, camping, rock climbing, swimming, fishing, hunting, horseback riding, and sightseeing. Portions of the area have been studied for downhill skiing. Preliminary studies indicate that the base facilities may have to be located at lower, generally nonskiable elevations. Skiers would then be transported up to the skiing area.

Two major range allotments are located partially within the unit: the Eddy Creek C&H and Bear Creek C&H allotments.

The proposed Mt. Eddy Research Natural Area (RNA), approximately 890 acres in size, is within this area.

The following sensitive plants species are found on Mt. Eddy:

Draba aureola Wats. (DRAU)

Epilobium siskiyouense (Munz.) Hoch & Raven. (EPSI)

Eriogonum umbellatum Torr. var. humistratum Reveal. (ERUMH)

Wildlife and cultural resource values are characteristic to this physiographic province.

Capability

Wilderness Attributes

Natural integrity is high and apparent naturalness is moderately high. The only limiting feature of these attributes is the presence of roads around and partially within the area which provide access for a large number of hunters and fishermen. There are several unimproved roads leading to Little Crater Lake, Dobkins Lake, and Deadfall Lakes, and on Mt. Eddy itself. These intrusions are not separable through a boundary adjustment and would have to be obliterated if the area was designated for wilderness.

Opportunity for solitude is moderately high. It would have outstanding solitude except for two limiting factors: its small size and the presence of permanent offsite intrusions. It is a relatively untouched area completely surrounded by intensive management activities which take place on public and private land.

The opportunity for primitive recreation is moderately high. The diversity of terrain and vegetation, the number of lakes and streams, and the variety of wildlife tend to offset its small size when considering primitive recreation opportunities.

Supplemental wilderness attributes (ecologic, scenic, etc.) include the aforementioned sensitive plants species, which make it a unique area for botanical study. As previously mentioned, a portion of the area has also been proposed for RNA establishment.

Manageability and Boundaries

Manageability could be enhanced by further adjustment of exterior boundaries. Nearly all the boundaries are located on unsurveyed land lines.

Also complicating manageability are the 2,126 acres in private ownership. These private lands contain desirable subalpine terrain and are distributed in such a manner that acquisition would be a key factor in improving manageability.

As mentioned previously, the overall small size of the area limits its suitability for wilderness designation. Any boundary adjustment which would further decrease size, would further diminish wilderness attributes.

Availability

The most significant potential use of this area, which would compete with wilderness designation, would be downhill skiing. This area has been inventoried for potential development of a downhill skiing facility with conceivably 60.0 thousand RVDs of use.

Potential hard rock mineral development also competes with wilderness values. Three prospecting sites for asbestos and one site for chromite development are located here.

Timber and forage values are insignificant and are not a factor in consideration for wilderness availability. The Mt. Eddy area contains an estimated 46.3 million board feet (MMBF) of standing sawtimber volume. Potential yields average 0.9 MMBF per year. There are about 3,400 acres of tentatively suitable timber lands, most of which exhibit low productivity for timber. Range use averages only 75 animal months (AMs) per year.

Recreation use consists primarily of dispersed camping, hiking, hunting, and fishing. Light, but steady, motorized dispersed recreation use occurs within the area. The recreation use season is limited to six months a year because of access problems during the wintertime.

The large amount of private land limits availability. These lands would have to be acquired to best meet wilderness or downhill skiing objectives.

The presence of botanic values, as well as the proposal for a RNA, outwardly complements the wilderness values. However, the management and protection of these values would limit the availability of the area for wilderness because of the need to control dispersed recreation use.

Need

Although a majority of the people who responded during the 1987 Roadless Area Review and Evaluation (RARE II) public involvement analysis were pro-wilderness, a vocal minority was in favor of non-wilderness. The latter group was motivated by the then-active proposal for a downhill skiing development.

Mt. Eddy is the last remaining undeveloped subalpine area along the Eddy Range; others have been logged and roaded. Recreation use has historically been limited to the summer months. New patterns of roaded motorized recreation have appeared as more jeep trails approach the perimeter of this area.

The potential wilderness opportunities in this area should be compared against those of its closest neighbor. Mt. Shasta is immediately across the valley and ten air miles away. The unique feature about Mt. Eddy, which is not present at Mt. Shasta, is the alpine lakes.

Alternatives Considered

B

Refer to **Table C-1** for land allocations (prescriptions) by alternative.

Under Alternative PRF (Preferred Alternative), the emphasis is on semi-primitive non-motorized and semi-primitive motorized recreation which appears to be in keeping with current and predicted recreation use trends. Under the Limited Roaded Motorized Recreation prescription (Prescription II), development of downhill skiing could be allowed if the need arose in the future.

Alternative RPA (1990 RPA Program Emphasis) emphasizes roaded natural recreation, with a small portion of the area allocated to timber management.

Alternative CUR (No Action/No Change) favors more semi-primitive motorized recreation than the other alternatives.

Alternative CBF (Citizens for Better Forestry) allocates the entire area to wilderness management and/or RNA establishment. Development of downhill skiing would not be considered under this alternative.

RNA allocations vary by alternative within this area. Under Alternative RPA (1990 RPA Program Emphasis) RNA establishment is not recommended. Alternatives PRF (Preferred Alternative), CUR (No Action/No Change), and CBF (Citizens for Better Forestry) have identified RNA values, and RNA establishment is recommended.

Environmental Consequences

C

Effects Due to Management Prescriptions

1. **Designation:** Wilderness

   Prescription: V - Wilderness Management

   Alternative: CBF (Citizens for Better Forestry).

Wilderness designation under this prescription would maintain natural integrity, apparent naturalness, opportunity for solitude, and primitive recreation opportunity in the short and long run.

With respect to the effects on non-wilderness resources and uses, prohibition of all statutable or non-conforming practices would limit multiple use outputs and uses of this area.

Vegetation would be left to cycle naturally over time. The total mix of wildlife assemblages and seral stages would be left to change primarily through natural processes.

Air quality would be maintained at a nondegradation level.

Grazing, where established, would continue on an extensive, rather than intensive basis. No fertilization, seeding of nonindigenous grasses, vegetative conversion, and/or water spreading would be allowed.

New mineral developments would be prohibited, assuming subsequent withdrawal of the area from mineral entry.

Recreation uses would be limited to primitive and, in some cases, semi-primitive non-motorized settings. Motorized dispersed recreation (off-highway vehicle [OHV] uses) would be prohibited under this management prescription. Approximately 60.0 thousand RVDs of downhill skiing use would be foregone.

Virtual nondisturbance of soils and watersheds would enhance water quality and fishery habitats. A slight decrease in water yield would occur in the long run.

No timber harvesting or road construction would be allowed.

Visual resources would be enhanced with a visual quality objective (VQO) of preservation.

2. **Designation:** Non-Wilderness

   Prescription: I - Unroaded Non-motorized Recreation

   Alternative: PRF (Preferred Alternative)

This prescription would maintain (not diminish) components of wilderness quality in the short run. Long-term improvements in wilderness quality would take place pending improvements such as trails, number of primitive campsites, and trailhead facilities just outside the area.

Restriction of vegetative management to nonmechanical methods would cause slightly favorable impacts on older over-mature dependent wildlife habitats. Late seral stage habitats would be allowed to cycle naturally over time with some assistance from prescribed burning.

Due to access and use of nonmechanical methods, opportunities to improve seral stage distribution, by prescribed burning, would be limited. In the long run, habitat values for early and mid-seral stage dependent species would gradually decline.

Air quality would be maintained at a nondegradation standard.

Grazing would continue on an extensive rather than intensive basis and would be coordinated with recreation use. Range improvement activities would be undertaken within the bounds of the adopted VQOs.

New and existing mineral developments would be allowed under plans of operation which provide for mitigation of soil and vegetative disturbances.

Recreation uses would be limited to primitive and semi-primitive non-motorized settings. Motorized, dispersed recreation (OHV uses) would be prohibited under this management prescription. Approximately 60.0 thousand RVDs of downhill skiing use would be foregone.

Nondisturbance of soils and watersheds would maintain water quality and fishery habitat. Water yield would decrease slightly in the long run.

Timber harvesting would be limited to catastrophic occurrences where salvage of the timber resource can be accomplished without road construction.

Table C-1
Mt. Eddy Roadless Area
Land Allocations by Alternative (Percent of Acres)

Management Prescription[1]	Name	ALTERNATIVE[2] PRF	RPA	CUR	CBF
I	Unroaded Non-motorized Recreation	70	0	0	0
II	Limited Roaded Motorized Recreation	5	0	45	0
III	Roaded Recreation	15	80	5	0
IV	Roaded, High Density Recreation	0	0	0	0
V	Wilderness Management	0	0	0	100[3]
VI	Wildlife Habitat Management	0	0	20	0
VII	Threatened, Endangered & Selected Sensitive Species	0	0	0	0
VIII	Timber Management	0	20	20	0
IX[4]	Riparian Management				
X	Special Area Management	10	0	10	0
XI	Cultural Resource Management	0	0	0	0

1 These prescriptions are described in detail in Chapter II.

2 PRF - Preferred Alternative
RPA - 1990 RPA Program Emphasis
CUR - No Action/No Change
CBF - Citizens for Better Forestry

3 Includes 10 percent in research natural areas.

4 All riparian areas will be managed according to Prescription IX. Acreages are not displayed because most acres are included in other more restrictive prescriptions.

Visual resources would be maintained for a retention and/or a partial retention VQO.

3. Designation: Non-Wilderness

Prescription: II - Limited Roaded Motorized Recreation

Alternatives: PRF (Preferred Alternative) and CUR (No Action/No Change)

This prescription would maintain most of the components of wilderness quality in the short run. Construction of primitive roads and use of mechanized equipment could cause wilderness character to decrease slightly over the long term.

Restriction on vegetative disturbance to low impact stand maintenance salvage harvesting could facilitate development of older over-mature dependent wildlife habitats. Late seral stage habitats would generally be allowed to cycle naturally over time, with some assistance from prescribed burning.

Due to limited access, opportunities to improve seral stage distribution, through prescribed burning, would be reduced. In the long run, habitat values for early and mid-seral stage dependent species would gradually decline.

Air quality would be maintained at a nondegradation standard.

Grazing would continue on an extensive rather than intensive basis and would be coordinated with recreation use. Range improvement activities would be undertaken within the bounds of the adopted VQOs.

New and existing mineral developments would be allowed under plans of operation which provide for mitigation of soil and vegetative disturbances.

Recreation uses would be limited to semi-primitive motorized settings. Motorized, dispersed recreation (OHV uses) would be permitted under highly suitable trails and areas. Approximately 60.0 thousand RVDs of downhill skiing could be realized should the demand develop.

Minimal disturbance of soils and watersheds would maintain high water quality. Water yield would decrease slightly in the long run. Fishery habitats would be enhanced.

Timber harvesting and associated road construction would be limited. Stand maintenance/salvage of dead, dying, or high risk trees would be the primary objective.

Visual resources would be maintained to meet retention and/or partial retention VQOs.

4. Designation: Non-Wilderness

Prescription: III - Roaded Natural Recreation

Alternatives: RPA (1990 RPA Program Emphasis); PRF (Preferred Alternative); and CUR (No Action/No Change)

Under this management prescription wilderness quality attributes would be moderately diminished. The character of the landscape would appear to be visually natural with obvious evidence of management including timber harvesting, road construction, and trailhead and other dispersed site construction.

Some mitigation on wilderness impacts could be done through intensity and timing of land management activities and visually screening developments using topographic and vegetative barriers. This area would be most beneficial to the recreationist seeking developed and less primitive opportunities.

Vegetative management would be used in support of recreation objectives. These practices would favor most wildlife habitats, as they would bring about a diverse range of seral stage conditions. Basically, values for wildlife habitat would be maintained.

Air quality would be maintained.

Grazing would be managed at intensive levels in key and highly suitable forage resource areas where they do not conflict with recreation. Grazing would continue on an extensive level elsewhere. Mitigation of impacts on wilderness values would be made by adjusting on-off grazing seasons, timing livestock movement between ranges, and minimizing range structures.

New and existing mineral developments would be allowed.

A full range of motorized and non-motorized recreation settings would occur. Some developed recreation would take place. Users would tend to concentrate near riparian areas (lakes, streams) and other natural attractions. Large areas, where no use or very light dispersed non-motorized use takes place, would be evident. Development of downhill skiing would occur if the need arose in the future.

Timber harvesting and associated road construction would focus on achieving recreation objectives. Timber yields would be less than the biological potential due to longer rotation lengths (120-140 years).

Existing VQOs would be enhanced in primary viewsheds and maintained elsewhere.

Water quality and fishery habitats would be maintained. Water yield would decrease slightly over the long term.

5. **Designation:** Non-Wilderness
   Prescription: VI - Wildlife Management
   Alternative: CUR (No Action/No Change)

Under this management prescription wilderness quality attributes would be moderately diminished. Forest vegetation would be managed to maintain or enhance wildlife habitat.

Remnants of natural integrity and apparent naturalness could exist. However, land management activities would be evident. Mitigation of impacts on wilderness values could be accomplished through increasing the time intervals between or intensity of management activities and/or visually screening developments using topographic and vegetative barriers.

Vegetative management would be applied to meet a wide range of seral stage requirements. In general, early, mid, and late-seral stage habitats would be maintained. No decline in viability for animal species would be anticipated.

Air quality would be maintained.

Grazing would be managed at intensive levels in key and highly suitable forage resource areas where it does not conflict with wildlife browse/forage resources. Grazing would continue on an extensive basis.

New and existing mineral development would be allowed.

A full range of motorized and non-motorized recreation settings, including developed recreation, would occur. Users would tend to concentrate near facilities (campgrounds, trailheads) which would be used as a base of operations for enjoying a wide variety of roaded natural recreation pursuits. There would be large voids where no activities occur or where only primitive recreation use takes place. Development of a downhill skiing facility would not be recommended under this prescription.

Timber harvesting and associated road construction would focus on meeting wildlife habitat management objectives. This would result in timber yields which are less than the biological potential due to longer rotation lengths (120-140 years).

VQOs would be partial retention and/or modification, depending on wildlife needs.

Water quality and fisheries habitat would be maintained. Water yield would decrease slightly over the long term.

6. **Designation:** Non-Wilderness
   Prescription: VIII - Timber Management
   Alternatives: RPA (1990 RPA Program Emphasis); and CUR (No Action/No Change)

All wilderness attributes would be diminished in areas subject to this prescription. Evidence of vegetation management would appear less natural on the landscape. Only those portions of the area not suitable for timber management and/or other commodity uses would remain undeveloped. However, this area is too small or narrow to appear primitive.

A full range of vegetative manipulation measures would be available, but they would tend to favor early seral stage dependent wildlife.

Air quality would be maintained in the long run. There would be brief, temporary periods of air quality degradation during timber harvesting, road construction, and log hauling.

Grazing would be managed at intensive levels in key and highly suitable forage resource areas where they do not conflict with intensive timber management objectives. Grazing would continue on an extensive rather than on an intensive level elsewhere in the area.

New and existing mineral development would be allowed.

A full range of motorized and non-motorized recreation settings would take place in this area. Roaded natural and rural recreation rather than primitive and semi-primitive situations would predominate.

Timber stands would be managed through stocking control measures with rotation lengths ranging from 70 to 130 years.

Visual resources would meet adopted VQO levels which, in most instances, would be modification. Some maximum modification could occur.

Assuming intensive application of Best Management Practices (BMPs), water quality and fisheries habitats would be maintained. Water yields would increase slightly.

7. Designation: Non-Wilderness
Prescription: IX - Riparian Management
Alternative: All alternatives

This prescription occurs in long, narrow corridors along streams or around bodies of water. Therefore, effects on wilderness would be influenced primarily by the prescriptions adjacent to the riparian areas. Management within the riparian areas would have little effect on wilderness values.

Under this prescription, there would be some latitude to use vegetation management to meet wildlife, fisheries, and water quality management objectives. In general, late seral stage dependent wildlife species would be favored at the expense of early seral stage dependent wildlife species.

Air quality would be dependent on activities in other prescription areas.

Grazing would be managed at intensive levels on highly suitable forage areas where it does not conflict with riparian management objectives.

New and existing mineral development would be allowed, based on plans of operation which clearly provide for mitigation of water quality degradation and soil and watershed disturbances.

A wide range of recreation activities and settings would be anticipated. Recreation uses would tend to concentrate along riparian areas where major attractions are located. Motorized and non-motorized forms of dispersed and developed recreation use would occur. OHV use would be confined to designated roads and trails.

Timber harvesting and associated road construction, where allowed, would be directed toward meeting riparian management objectives. Timber yields would be much less than full biological potential and not scheduled at all along Class I, Class II, and Class III streams.

Existing inventoried VQOs would be maintained.

Water quality and fishery habitats would be enhanced with little or no effects on water yield over the long run.

8. Designation: Non-Wilderness
Prescription: X - Special Areas (Research Natural Areas - [RNAs] and Special Interest Areas -[SIAs])
Alternative: All alternatives except RPA (1990 RPA Program Emphasis)

This prescription would enhance natural integrity and apparent naturalness. Because of the research purposes primitive recreation would not be encouraged in RNAs. Primitive recreation is encouraged in SIAs.

The opportunity for solitude would be enhanced. Primitive recreation opportunities would be limited by research objectives in RNAs but not in SIAs.

Prohibition of vegetative management would cause short-term favorable impacts on older over-mature dependent wildlife habitats. Late seral stage habitats would be allowed to cycle naturally over time. Conversely, early to mid-seral stage dependent wildlife habitats would decline in value.

Air quality would be maintained at a nondegradation level.

Grazing, where established, would continue on an extensive basis provided that conflicts with research purposes are minimized. No intensive grazing practices (e.g., fencing, fertilization, seeding, vegetative conversion, water spreading, etc.) would be allowed.

New mineral development would be prohibited, assuming subsequent withdrawal of the area from mineral entry. Established mineral rights would be managed under plans of operation which would minimize disturbances to the vegetation.

Recreation uses would be limited to primitive and semi-primitive non-motorized settings. Motorized dispersed recreation (OHV uses) and downhill skiing would be foregone.

The risks of disturbance to soils and watersheds would be decreased with decreases in water yield in the long run.

No timber harvesting and associated road construction would be allowed. Road and/or trail construction would be limited to RNA/SIA needs.

Visual resources would be natural in appearance. Areas would be managed to meet a VQO of preservation.

Synergistic Effects of Alternatives

1. Alternative PRF (Preferred Alternative). Impacts of this alternative on wilderness values would be relatively low. Eighty-five percent of the area is allocated to Prescriptions I (Unroaded Non-motorized Recreation), II (Limited Roaded Motorized Recreation), or X (Special Area Management). These prescriptions would retain most wilderness attributes.

The remaining 15 percent of the area would be allocated to Prescription III (Roaded Recreation). These prescriptions would affect wilderness values in a small portion of the area.

2. Alternative RPA (1990 RPA Program Emphasis). Under this alternative, the majority of the area would be allocated to Prescription III (Roaded Recreation) and Prescription VIII (Timber Management) which would substantially modify the wilderness attributes. This alternative would allow motorized recreation and timber harvesting. Visual resources would be maintained at the present inventoried VQOs on about 80 percent of the area.

3. Alternative CUR (No Action/No Change). This alternative would allow resource development, including timber harvesting and wildlife habitat manipulation, on 45 percent of the area. The remaining area would generally retain most of its wilderness character under Prescription II (Limited Roaded Motorized Recreation), and Prescription X (Special Area Management).

4. Alternative CBF (Citizens for Better Forestry). Under this alternative, the entire area would be allocated to Prescriptions V (Wilderness Management) and X (Special Area Management). These prescriptions would maintain the wilderness character.

Motorized recreation and use by OHV users would be prohibited. Visual quality objectives would be preservation.

II. Land Management Disposition Proposed for Roadless Areas Managed for Non-wilderness Under the 1984 California Wilderness Act

General Discussion

The 1984 California Wilderness Act allowed for non-wilderness multiple-use management of 29 individual roadless areas. (Refer to the wilderness and inventoried roadless areas map in the map packet for the location of these areas.)

These roadless areas, totalling 306,060 acres of National Forest land, would be subject to varying degrees of resource development activities depending on the themes of the four alternatives considered in detail in this Draft EIS and the mix of Management Prescriptions applied to them. There are 10 Management Prescriptions considered in the land allocation for each of the 29 released roadless areas. They are:

- I Unroaded Non-motorized Recreation
- II Limited Roaded Motorized Recreation
- III Roaded Recreation
- IV Roaded, High Density Recreation
- VI Wildlife Management
- VII Threatened, Endangered, and Selected Sensitive Species
- VIII Timber Management
- IX Riparian Management
- X Special Area Management
- XI Cultural Resource Management

These prescriptions are described in Chapter II.

Descriptions of the 29 released roadless areas follow.

Description of Released Roadless Areas

1. Backbone: 9,976 acres

This area is located immediately adjacent to (and west of) Shasta Lake. Over 25 percent of the area is in private ownership. Elevations range from 1,200 feet along the shoreline to over 4,500 feet on the ridges adjacent to Schell Mountain. Vegetation consists of predominantly mixed conifer within the southern third of the area. The remainder is a diverse mixture of live and black oak, digger pine, and manzanita. One developed recreation site (e.g., Gooseneck Cove) receives light to moderate use. There is very little dispersed recreation use in the rest of the area (usually fishing). A small portion of the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA) is within this area.

2. Bell-Quinby (B): 11,707 acres

This area is located approximately six miles north of Burnt Ranch on the west side of the New River drainage. It is almost entirely surrounded by roads and is bounded on the north by the Trinity Alps Wilderness. The area is extremely rugged and steep with elevations ranging from 1,380 feet along New River and Quinby Creek to 5,864 feet at the north end of the unit. Vegetation ranges from mixed conifer species on the north slopes to brushfields and hardwoods on the south slopes. Present recreation use centers around hiking along a jeep and foot trail that runs through the unit.

3. Bonanza King: 16,386 acres

This area has been substantially roaded since the RARE II roadless inventory. A large portion of the area is in private ownership. It is located about five miles north of the Trinity Unit of the NRA. Elevations range from 2,500 feet along the Trinity River to 7,000 feet along the Bonanza King divide. Terrain is steep and rugged and nine perennial streams originate in the area. Vegetation consists of mostly manzanita within the western one-third. Mixed conifer and ponderosa stands occur at lower elevations within the rest of the area. Existing habitat supports populations of deer and small game. Trails follow the East Fork of the Trinity River and access Grouse Lake. The area receives moderate recreation use which consists of hunting, fishing, and other non-motorized dispersed use.

4. Castle Crags (B): 1,732 acres

This area is located about 8 miles southwest of Mt. Shasta City and 50 miles north of Redding. It adjoins the Castle Crags Wilderness. Elevations range from 5,600 to 6,600 feet. Terrain is mountainous with some sheer rock cliffs. Vegetation consists of large brushfields with scattered mixed conifers in the draws. Three alpine lakes are present. Access into the area is provided by only a few trails. A portion of the Pacific Crest Trail (PCT) is located along the southern boundary. Opportunities for primitive recreation are moderately high.

5. Chanchelulla: 3,865 acres

This area is located approximately 10 miles southeast of the community of Hayfork adjacent to the Chanchelulla Wilderness. Elevation ranges from 2,700 feet near the East Fork of Hayfork Creek to about 5,000 feet in the southeast corner along the Wilderness boundary. Vegetation consists of extensive brush fields on south-facing slopes and mixed conifer on north-facing ones. Significant commercial timber stands are found in the area. The area contains deer habitat. There are some trails in the area. Present dispersed recreation use is very low and occurs primarily as fishing.

6. China Springs (B): 707 acres

This area is located approximately 14 miles north of Junction City. It is contiguous to the Trinity Alps Wilderness. Elevations range from 2,500 feet to 4,000 feet. Vegetation consists primarily of mixed conifer forests. Chaparral and oak types occupy some of the more exposed, south facing slopes. The western boundary of the unit is formed by a road system that winds its way up the steep ridge leading to China Springs. Short sections of spur roads, hiking trails, water developments, and miners cabins sprinkle the landscape at the edges of this area. Dispersed recreation use presently occurring within the area consists of a small amount of hiking, fishing, and hunting.

7. Chinquapin: 21,520 acres

Older over-mature Douglas-fir forests blanket the rugged steep slopes of ridges and creek drainages in this area. Specimen sized chinquapins grow throughout the area. Seventy percent slopes and unstable soils are common. This area is located about 1.5 miles southeast of Forest Glen and Highway 36 and is more than a two-hour drive from Redding. Major tributaries to the South Fork Trinity River are found throughout the area. Water quality is high and unpolluted. The southwestern portion contains the highest elevations, culminating at 5,900 feet. Lack of vegetative diversity and steep terrain limit varied opportunities for primitive recreation. Present recreation use is moderate and confined mostly to the South Fork Trinity River water influence zone.

8. Cow Creek: 23,152 acres

This area is located about 30 miles west of Weaverville north of U.S. Highway 299. Elevations range from 5,255 feet at Ironside Mountain to 1,500 feet in the Trinity and New River canyons. Rock bluffs and steep talus slopes are predominant throughout the area. Vegetation consists of mixed conifer, oak, chaparral, digger pine, and manzanita. Present dispersed recreation use is confined along the Trinity River and New River. Fishing, rafting, hiking, and hunting occur within this corridor.

9. Devils Rock: 13,896 acres

This area is located near the Pit River Arm of Shasta Lake, approximately 24 miles northeast of Redding. The limestone outcroppings are visually pleasing. The Shasta salamander, which inhabits the formations, and the sensitive plants within the area are the prime ecological features. Elevations are low, mostly 1,500 to 2,500 feet, with Brock Butte peak at 3,459. Recreation use is light and consists primarily of hunting big game and wild turkey. Three trailheads lead up three of the permanent creeks in the area.

10. Dog Creek: 5,543 acres

The area has been substantially roaded since the RARE II roadless inventory. Over 15 percent of the area is in private ownership. It is located immediately west of the Sacramento River and about five miles north of Shasta Lake. Elevations range from 1,100 feet in the northeast corner of the area (adjacent to the Sacramento River) to 4,300 feet along the southern boundary. Characterized by steep slpes and rugged terrain, the area is heavily dissected by intermittent stream courses. Vegetation is predominately mixed conifer and pine forest with some areas of Douglas-fir-pine in the upper reaches of Little South Fork of Dog Creek drainage. Primitive recreation opportunities are very limited due to the area's small size and rather homogeneous landscape. Present and potential recreation use is light and is composed primarily of hunting and fishing.

11. Eagle: 6,798 acres

The area has been substantially roaded since the RARE II roadless inventory. It is located approximately six air miles east of Big Bar and eight air miles west of Weaverville south of U.S. Highway 299. Elevations range from 1,700 feet near the north edge of the area near Hocker Flat to approximately 5,700 feet at the top of the ridge (in the vicinity of Squaw Creek). The area is characterized by rugged terrain and steep slopes. Five perennial streams are present. There are several human-made intrusions in this area. A timber access road system was constructed and timber was harvested in 1982 and 1983 by the private landowner within the area. Since the 1984 California Wilderness Act, additional timber access roads have been built. Hunting constitutes the majority of the current recreation use in the area.

12. East Beegum: 7,963 acres

This area is located about 3 miles south of the Platina Canyon on Highway 36 and 8 miles north of the Yolla Bolly Middle-Eel Wilderness. Land administered by the Bureau of Land Management (BLM) is immediately to the east. Elevations range from 1,700 feet on Beegum Creek to 4,900 feet at Little Red Mountain. Vegetation changes from brush types, such as chaparral and manzanita at lower elevations, to stands of mixed conifers at the higher elevations. The area provides winter range for deer. Recreation use is light and generally confined to the South Fork of Beegum Creek's water influence zone. Trailheads are located at two Forest Service developed camp sites, North Fork Beegum and Beegum Gorge. Trails run along the North Fork of Beegum Creek, and a few other hiking trails follow the ridge tops.

13. East Fork: 5,195 acres

The northern boundary begins at the Rat Trap Gap Road (FH 35) at an elevation of 3,200 feet. It rises on the south side of the area and reaches a high elevation of 7,200 feet at the Yolla Bolly-Middle Eel Wilderness boundary. The East Fork of the South Fork of the Trinity River runs through the area. Primitive recreation is limited by lack of diversified terrain and vegetation. Vegetation consists of predominantly older over-mature mixed conifers south of the river with brush interspersed. Deer are common here.

14. East Girard: 27,914 acres

This area has been substantially roaded since the RARE II roadless inventory. Over 30 percent of the area is in private ownership. It is located about 15 miles northwest of Montgomery Creek. More than 14 buttes and mountains, ranging from 3,900 feet to 5,300 feet in elevation, are present. At least six major tributaries to the McCloud River and Squaw Creek originate within the area. The north and northwest portions of the area are adjacent to the McCloud River. Mixed conifer stands cover the majority of the area, including some areas with a large amount of Douglas-fir. Live oak, black oak, and manzanita grow in pockets throughout trhe area. Opportunities for dispersed recreation are limited due to the absence of lakes, uniform topography, and vegetation. Recreation use is currently light, consisting mostly of fishing and hunting.

15. Fisher Gulch: 4,472 acres

The area, whose chief value is wildlife habitat, water quality and scenic value, is located about 8 miles north of Junction City. From a topographic standpoint, the area consists of a series of 5 short northeast/southwest running ridges. These ridges are components of a major divide between the East Fork of the Trinity River and Canyon Creek watersheds. Elevations range from 2,600 feet to about 4,600 feet. The area contains a wide variety of mixed conifer; drier locations contain digger pine and shrub types which are extremely dense and impenetrable. Recreation use is hampered because of the dense brush and rugged terrain. Moderate use is generally concentrated around roads, trails and trailheads leading into the Trinity Alps. Indications of mineral development are exemplified by the mines in the East Fork of the Trinity River watershed located within and/or adjacent to this area. Extensive mineral development, yielding many tons of gold ore, occurred between 1882 and 1904.

16. Kettle Mountain: 4,865 acres

Minor roading has occurred in this area since the RARE II roadless inventory. Over 50 percent of the area is in private ownership. It is located about 5 miles northwest of Montgomery Creek. Elevations range from 1,400 feet along the Pit River to 3,600 feet on Kettle Mountain. Moderately steep slopes and very irregular, heavily dissected hillsides characterize the area. Vegetation is classified predominately as mixed conifer with areas of live and black oak interspersed on drier sites. A peregrine falcon territory has been identified north of the Pit No. 6 Reservoir. The apparent naturalness of the area is impacted most by road construction, logging, and the presence of the reservoir and its facilities. Dispersed recreation use is currently light, mostly in the form of deer hunting in the fall.

17. Little French Creek: 11,227 acres

This area is adjacent to and bounded on the north by the Trinity Alps Wilderness. It is located north of the town of Big Bar and about 21 air miles from Weaverville. The area is characterized by rugged terrain and steep slopes. Vegetation consists of brushfields, hardwoods, and digger pine at lower elevations (1,400 feet) while the higher elevations (approximately 5,900 feet) support mixed conifer stands. Several major trails traverse the area providing a means of off-highway vehicle (OHV) use. This use is confined to primitive jeep trails along the

tops of north-south ridges. The use, although light, is well established. The area is used as an entrance to the southern edges of the Trinity Alps Wilderness area.

18. Mt. Shasta (B): 2,958 acres

The area lies northeast of Mt. Shasta City. It joins the Mt. Shasta Wilderness on the north, west, and south. It is characterized by rugged terrain containing old lava flows. Elevations range from 4,400 to about 9,000 feet. Mt. Shasta frequently creates its own climate and wind flow which affects the Mt. Shasta (B) area. The area receives a high amount of dispersed camping and hiking use. Recreation use is concentrated in the Bunny Flat-Sand Flat area, a takeoff point for most hikers who climb Mt. Shasta. Snow play (nordic skiing and snowmobiling) is popular during the winter.

19. Murphy Glade: 1,018 acres

This area is adjacent to the Yolla Bolly-Middle Eel Wilderness. Elevations range from 5,600 to 7,200 feet near the ridges adjacent to the Wilderness boundary. Vegetation consists primarily of older over-mature Douglas-fir sawtimber. The area is used as a trailhead for access to the Wilderness. Present recreation use is extremely light.

20. Panther: 11,727 acres

Minor roading has occurred in this area since the RARE II roadless inventory. The area is located about 5 miles west of Big Bar and 22 miles west of Weaverville south of U.S. Highway 299. Elevations range from 1,000 feet along the canyon of the main stem of the Trinity River to 5,200 feet at Monument Peak. Six perennial streams flow through the area. Vegetation consists of mixed conifer communities of Douglas-fir-ponderosa pine to the more typical communities composed of various mixtures of Douglas-fir, incense cedar, sugar pine, and ponderosa pine. Tanoak, digger pine, chaparral, and oak occur on the drier sites. Most of the recreation use occurs along the Trinity River in the form of fishing and rafting. Some hunting occurs along the southern edges of the area.

21. Pattison: 28,326 acres

This area is located 14 miles northwest of the Hayfork Valley. It is located equidistant from the Trinity Alps Wilderness to the north and the Yolla Bolly-Middle Eel Wilderness to the south. Elevations range from 1,650 feet along Hayfork Creek to more than 5,100 feet near Pattison Peak. Vegetation consists of large brushfields, mixed conifer timber stands, and true fir communities. At least one cultural site (an Indian village) is known to exist. The area provides habitat for some older over-mature dependent species as well as bear. Recreation is comprised mostly of off-highway vehicle (OHV) use on numerous jeep trails and includes some hunting and fishing.

22. Penney Ridge: 4,844 acres

The area joins the Yolla Bolly-Middle Eel Wilderness along one half mile of its eastern boundary. Penney Ridge is remote and environmentally similar to the adjacent wilderness. Elevations range from 3,000 to 5,400 feet with 70 percent slopes. Vegetation is characterized by older over-mature mixed conifers on north-facing slopes and oak grass openings and brushfields on south-facing slopes. Recreation activities are limited to occasional hiking and hunting.

23. Salt Gulch: 6,657 acres

The area has been substantially roaded since the RARE II roadless inventory. It is located approximately nine miles southeast of the community of Hayfork. Elevations range from 2,800 feet near Hayfork Creek to over 4,300 feet. The area is generally situated on a large, highly dissected ridge which forms a divide between Salt Creek and Hayfork Creek. Vegetation consists of Douglas-fir-pine-mixed conifer forests on moist, north slopes, mixed conifer forests on the less moist, north-facing slopes, and woodland-chaparral on the south-facing, dry slopes of the unit. The area contains wildlife habitat for deer. Timber harvest has occurred in the area in the past. Present recreation use is low and consists mainly of fishing.

24. Slate Creek: 6,616 acres

The area has been substantially roaded since the RARE II roadless inventory. It is located about 4 miles west of the Sacramento River and the town of LaMoine. Elevations range from 2,000 feet along Slate Creek near its confluence with the South Fork, to 4,200 feet on the western divide. The area is moderately steep, with rugged terrain and well dissected hillsides. Vegetation consists of mixed conifer-ponderosa pine stands with occasional patches of hardwoods, manzanita, and fir at higher elevations. A high degree of forest management, including timber harvest, has occurred in the last five years. Recreation use is currently light with the use being equally divided between hunting, fishing, dispersed camping, and OHV use.

25. South Fork: 17,261 acres

The area is located about 6 miles south of Hyampom Valley. Special features include Marble Caves, located about 1 mile north of Forest Glen near the extreme southern end of the area, and cultural sites consisting of an old Indian village. Approximately 10.5 miles of the South Fork of the Trinity River, located within this area, are designated as part of the National Wild and Scenic Rivers System. Much of the area is covered with extensive brushfields with some mixed conifer timber on north facing slopes. Elevations range from 1,600 feet along the river to 4,900 feet at the top of Bear Wallow Mountain. The South Fork supports a valuable anadromous fishery

and contains valuable spawning habitats. The diversity in this area somewhat offsets the confinements of the steep topography. Recreation use is moderate to heavy in the River corridor. Hiking, camping, rafting, prospecting, and dispersed camping all take place, but fishing is the primary activity.

26. Underwood: 3,219 acres

The area is about 27 miles west of Hayfork and lies within the South Fork of the Trinity River watershed. The majority of the area is within the Six Rivers National Forest. Underwood Mountain is a prominent topographic feature. Elevations range from 1,920 feet to over 4,000 feet. Vegetation consists of large brushfields and mixed conifer timber stands. Dispersed recreation use is limited to hunting.

27. Wells Mountain: 6,144 acres

The area has been substantially roaded since the RARE II roadless inventory. Over 35 percent of the area is in private ownership. It is located about 7 miles east of Hayfork. Elevation varies from 2,500 feet in the streams to over 5,000 feet at Wells Mountain. In general, the area is very steep and rugged and is characterized by mature dissected topography. Ten tributary streams feed into Carr Creek to the north and to Hayfork Creek on the south and west. Vegetation consists of mixed conifer species on the north slopes and extensive brushfields and hardwoods on the south slopes. Recreation use is extremely light within this area and is composed primarily of hunting and fishing.

28. West Beegum: 5,480 acres

The area is located about 3 miles south of Platina Canyon on Highway 36 and 8 miles north of the Yolla Bolly-Middle Eel Wilderness. Beegum Gorge is the outstanding topographic feature. The northern edge of the area is formed by Noble Ridge while Little Red Mountain Ridge forms the southern boundary. A foot and horse trail follows main Beegum Creek and the North Fork and Middle Fork of Beegum Creek. Opportunities for primitive recreation, including fishing and hunting, are moderately low.

29. West Girard: 34,892 acres

The McCloud River watershed forms the focus of West Girard. The McCloud River is classified as a world class trout stream. West Girard is located approximately 9 miles south of the town of McCloud. This area is characterized by steep to very steep slopes with elevations ranging from 2,200 feet in river canyon bottoms to 5,600 feet near Tombstone Mountain. Vegetation consists of brushfields and mixed conifers. Wildlife include Rocky Mountain elk and wild turkey. Scientific interest is focused on limestone formations which occur in scattered locations throughout the area. Limestone formations near Tombstone Mountain contain several unexplored caves.

Table C-2 shows the disposition of each roadless area by alternative. It includes the area name, National Forest acreage, and the approximate percentage of each Management Prescription applied in each alternative.

Table C-2
Roadless Area Prescriptions by Alternative
(Percent of Area)

Number	Roadless Area	National Forest Acreage	Management Prescription	PRF	RPA	CUR	CBF
1.	Backbone	9,976	II	10	0	0	0
			III	20	30	35	25
			VI	60	35	5	40
			VII	5	<5	<5	<5
			VIII	5	35	60	35
2.	Bell-Quinby (B)	11,707	VII	100	100	100	100
3.	Bonanza King	16,386	II	<5	0	<5	0
			III	15	15	15	<5
			VI	45	35	25	70
			VII	5	0	0	0
			VIII	35	50	60	30
4.	Castle Crags (B)	1,732	VI	0	0	0	15
			VII	90	90	90	85
			VIII	10	10	10	0
5.	Chanchelulla	3,865	VI	5	5	5	5
			VII	95	95	95	95
6.	China Springs (B)	707	VII	100	100	100	100
7.	Chinquapin	21,520	I	0	0	0	10
			II	0	0	0	5
			VI	0	0	5	0
			VII	60	75	65	55
			VIII	15	25	20	5
			X	25	0	10	25
8.	Cow Creek	23,152	I	<5	<5	5	<5
			II	10	10	5	10
			III	35	5	30	30
			VI	15	40	5	10
			VII	40	45	45	50
			VIII	<5	<5	10	<5
9.	Devils Rock	13,896	I	0	0	0	50
			II	25	0	0	0
			III	0	20	20	<5
			IV	<5	<5	<5	0
			VI	35	25	0	<5
			VII	5	<5	<5	15
			VIII	5	55	45	<5
			X	30	0	30	30
10.	Dog Creek	5,543	III	15	<5	<5	0
			VI	5	15	10	30
			VII	25	30	30	45
			VIII	55	55	60	25

Table C-2 (Continued)
Roadless Area Prescriptions by Alternative
(Percent of Area)

Number	Roadless Area	National Forest Acreage	Management Prescription	PRF	RPA	CUR	CBF
11.	Eagle	6,798	III	25	5	20	25
			VI	30	25	0	0
			VII	15	15	15	50
			VIII	30	55	65	25
12.	East Beegum	7,963	I	80	0	0	90
			VI	5	80	80	<5
			VII	<5	<5	<5	<5
			VIII	10	15	15	5
			X	5	5	5	5
13.	East Fork	5,195	I	0	0	0	60
			II	20	20	20	0
			III	0	0	5	<5
			IV	0	0	<5	0
			VI	0	0	<5	0
			VII	35	35	35	35
			VIII	45	45	40	5
14.	East Girard	27,914	I	<5	<5	0	15
			II	0	0	0	<5
			III	0	5	5	0
			VI	25	0	10	5
			VII	50	50	50	50
			VIII	25	45	35	30
15.	Fisher Gulch	4,472	I	25	0	0	30
			III	0	0	30	0
			VI	5	25	0	0
			VII	70	70	70	70
			VIII	0	5	0	0
16.	Kettle Mountain	4,865	II	40	0	0	0
			III	0	35	20	35
			VI	0	0	0	90
			VII	<5	5	5	5
			VIII	60	60	75	5
17.	Little French Creek	11,227	I	0	0	0	40
			III	45	30	30	10
			VI	10	25	25	0
			VII	45	45	45	50
			VIII	<5	<5	<5	<5
18.	Mt. Shasta (B)	2,958	I	25	0	0	55
			III	55	70	80	10
			VI	0	0	0	15
			VII	15	15	15	15
			VIII	0	10	0	0
			X	5	5	5	5

Table C-2 (Continued)
Roadless Area Prescriptions by Alternative
(Percent of Area)

Number	Roadless Area	National Forest Acreage	Management Prescription	PRF	RPA	CUR	CBF
19.	Murphy Glade	1,018	III	0	0	5	0
			VII	5	0	0	5
			VIII	95	100	95	15
			X	0	0	0	80
20.	Panther	11,727	III	45	45	50	50
			VI	20	20	15	0
			VII	35	35	35	50
21.	Pattison	28,326	I	55	30	0	70
			III	10	<5	30	<5
			VI	<5	5	10	<5
			VII	15	15	15	15
			VIII	20	50	45	<5
			X	0	0	0	15
22.	Penney Ridge	4,844	I	35	30	30	95
			VI	<5	30	0	0
			VII	<5	<5	5	<5
			VIII	65	40	65	5
23.	Salt Gulch	6,657	III	<5	0	0	0
			VI	5	5	10	10
			VII	95	90	90	90
			VIII	0	5	<5	0
24.	Slate Creek	6,616	VI	0	0	20	15
			VII	50	50	50	50
			VIII	50	50	30	35
25.	South Fork	17,261	I	70	35	15	80
			II	<5	10	<5	<5
			III	5	5	15	0
			VI	<5	5	10	<5
			VII	20	15	20	20
			VIII	10	30	40	<5
26.	Underwood	3,219	I	0	0	0	95
			VI	70	5	50	0
			VII	0	0	0	<5
			VIII	30	95	50	5
27.	Wells Mountain	6,144	III	35	35	35	35
			VI	45	5	65	60
			VII	20	0	0	5
			VIII	0	60	0	0
28.	West Beegum	5,480	I	90	0	0	90
			III	10	0	5	5
			VI	<5	70	85	<5
			VII	<5	5	0	<5
			VIII	<5	30	10	5

Table C-2 (Continued)
Roadless Area Prescriptions by Alternative
(Percent of Area)

Number	Roadless Area	National Forest Acreage	Management Prescription	PRF	RPA	CUR	CBF
29.	West Girard	34,892	I	20	10	0	30
			II	0	0	0	<5
			III	0	<5	<5	0
			VI	20	10	<5	<5
			VII	60	60	60	60
			VIII	0	20	35	<5
			X	0	0	0	10

APPENDIX D

Economic Efficiency Analysis

APPENDIX D
Economic Efficiency Analysis

Conceptual Background

Present Net Value

Present Net Value (PNV) is the criterion used to maximize net benefits in planning benchmarks and alternatives for the Shasta-Trinity National Forests. For each alternative, PNV is the difference between the discounted value of all priced outputs and all Forest Service management and investment costs over the analysis period. The priced outputs are those that are or can be exchanged in the market place. They include the value of forage, timber stumpage, commercial fish in streams, miscellaneous harvested products, increased water flow, in-the-ground minerals, and all recreation visitor days including those for wildlife, fishing, and wilderness experiences.

The alternatives are designed and analyzed to achieve the goals and objectives for priced outputs in a manner that achieves the greatest excess in the value of priced outputs in relation to their cost, while meeting all specified constraints and objectives for non-priced outputs. The alternatives are also designed to achieve the specified non-priced outputs and to meet constraints at the least cost. Thus, the PNV of each alternative estimates the value of the maximum attainable net benefits of priced outputs. It is the value of priced benefits realized in excess of all the Forest Service costs of producing priced outputs and non-priced outputs and meeting management constraints. PNV, therefore, is an estimate of the market value of the current forest resources after all costs of producing outputs and meeting constraints have been subtracted from the value of the expected flow of priced outputs.

Net Public Benefit

Net Public Benefit (NPB) is defined as the overall value to the nation of all outputs and positive effects (benefits) less all the associated Forest Service inputs and negative effects (costs) for producing those primary benefits, whether they can be quantitatively valued or not. Thus, NPB conceptually are the sum of PNV plus the full value of non-priced outputs. The full value of non-priced benefits is used because their cost of production has been accounted for in PNV. The non-priced benefits included here are: (1) outputs such as threatened and endangered species maintenance or enhancement; (2) natural and scientific areas; (3) cultural site reservations such as Indian religious sites and historical or anthropological sites; (4) visual quality; and (5) diversity objectives or air quality in excess of minimum management requirements. Minimum management requirements in this context are standards that must be met in the production of any or all outputs from the Forests. The minimum level, therefore, is a cost of production in the multiple use context.

Secondary or induced benefits and costs also result from National Forest management activities. These include local income and job effects on economic development of communities, net cost to taxpayers, price effects on consumers of forest products and other producers of those products, payments to communities in lieu of taxes, and subsidies to specific users of National Forest outputs. All these are distributive welfare effects of National Forest production. The foregoing distributive effects and impacts have been the object of national policy issues and discussions in both the Administration and the Congress. Because they are distributive effects, they are essentially questions of equity rather than efficiency, and they involve questions of who should get benefits and who should pay the costs. They cannot be assessed in the context of the efficiency criteria associated with the PNV and the NPB concepts.

Draft EIS Presentation

The methodology, background, and results of the economic efficiency analysis that was conducted during the planning process is presented throughout this Draft Environmental Impact Statement (Draft EIS). As a result, all of the major sections of this document, including those listed below, must be read in order to get a complete picture of the analysis that was conducted.

Context	Reference
Discussion of how economic efficiency analysis was used in the process of developing alternatives.	Chapter II, parts B and F
Outputs, total cost, and PNV for each of the benchmarks.	Chapter II, parts C and F

Context (continued)	Reference
Results of the constraint analysis and a comparison of the alternatives in terms of PNV. This is the most comprehensive summary of the analysis results in this document.	Chapter II, part F
Background information on economic conditions and their resource supply-demand situation for the Forests.	Chapter III
How and why PNV of the alternatives differs.	Chapter IV
Technical details of the modeling and analysis process including a description of basic estimates and assumptions on benefits, costs, and interest rates.	Appendix B

APPENDIX E

Wild and Scenic Rivers Evaluation

APPENDIX E
Wild and Scenic Rivers Evaluation

Introduction

A

Public Issues

This discussion includes an analysis of resource trade-offs involved in the potential additions to the Wild and Scenic Rivers System. The Department of Interior completed a screening and evaluation of the inventoried rivers in the Nationwide Rivers Inventory in 1982.

In January, 1981, 106.4 miles of wild, scenic, and recreation rivers on the Shasta-Trinity National Forests were designated by the Secretary of Interior. This designation was made in response to a request by the State of California for additions to the system under provisions of the Wild and Scenic Rivers Act. No further analysis or study is needed for these rivers.

The following rivers have been identified for further study: (1) the McCloud River, generally located northeast of Redding, in Shasta and Siskiyou Counties, with its terminus at Shasta Lake; (2) the Sacramento River from Box Canyon Dam to Shasta Lake; (3) The upper Sacramento River above Box Canyon Dam; (4) Beegum Creek from the Forest boundary to the headwaters; and (5) the upper segments of the North Fork and South Fork Trinity River and Virgin Creek, located west of Redding in Trinity and Tehama Counties. The South Fork and North Fork Trinity River are the headwaters of the mainstem Trinity River, which is a tributary of the Klamath River.

In addition, based on public comments and recommendations, three other streams were evaluated: (1) Canyon Creek, from the headwaters in the Trinity Alps Wilderness to the confluence with the mainstem of the Trinity River; (2) Hayfork Creek, from 9 Mile Bridge to the confluence with the South Fork Trinity River; and (3) Squaw Valley Creek from the confluence of Cabin Creek to the confluence with the McCloud River.

The following public issues focus on the Wild and Scenic Rivers and other water courses on the Forests:

a. **How should the Forests' vegetative resources be managed for ecosystem diversity? Special consideration would be given to providing habitats that maintain or enhance populations of threatened and endangered (T&E) species and viable populations of sensitive species and/or management indicators.** *(Public Issue #2)*

There is public concern that a wide variety of ecosystems should be maintained on the Forests to specifically provide for the:

1. Maintenance and/or enhancement of habitats for Federally listed T&E species (plants and animals);

2. Maintenance and/or enhancement of habitats sufficient to provide for viable populations of all other existing species (plants and animals);

3. Maintenance and/or enhancement of the Forests' existing ecosystems and the biodiversity (plants and animals) associated with them; and

4. Maintenance and/or enhancement of special elements or components of these ecosystems (i.e., snags, down logs, cliffs, vegetative seral stages, etc.).

b. **How should watersheds be managed to maintain or enhance water quality and fisheries?** *(Public Issue #6)*

The Shasta-Trinity National Forests contain the headwaters of two important watersheds in the State: the Sacramento and Trinity Rivers. These watersheds provide high quality water that has a broad variety of uses, including that of supporting an important anadromous (salmon and steelhead) fishery.

c. **How should the Forests supply water-oriented recreation facilities and opportunities to meet increasing demand?** *(Public Issue #12)*

There is a statewide public need for additional water-oriented recreation activities. The Forests have the potential to supply most forms of water-oriented recreation. However, the current supply of support facilities will not meet estimated demand. Conflicts are occurring between different types of use.

d. **How wide should riparian management zones (RMZs) be and what management activities should be allowed within them?** *(Public Issue #13)*

Forest management activities have the potential to affect water quality and the fisheries resource on the Forests. Timber harvesting, prescribed burning, and road construction near streamcourses are of particular concern to

many people, because these activities have a high potential for degrading water quality and fisheries habitat.

e. **What river segments should be recommended for inclusion in the Federal Wild and Scenic Rivers System?** *(Public Issue #20)*

Portions of New River, the North Fork and South Fork of the Trinity River, and the Trinity River were added to the National Wild and Scenic Rivers System in 1981. Several other major rivers and streams on the Forests have the potential for Wild and Scenic River designation. This designation would maintain examples of pristine aquatic and riparian ecosystems and provide river-oriented recreational opportunities. There is concern that designation would restrict other management activities, such as timber harvesting, and adversely affect private inholdings.

Description of Rivers

B

Refer to maps in this appendix for the geographic location of each of the following rivers:

Beegum Creek

Beegum Creek forms the common boundary southwesterly and northwesterly of Shasta and Tehama Counties, respectively.

Main Fork: From Round Bottom in Section 5 (T.28N R.10W) to the Forest boundary, Section 5 (T.28N R.9W).

South Fork: From headwaters of South Fork, Section 36 (T.28N R.10W), adjacent to Forest Road 28N36 to the confluence of Middle Fork, Section 6 (T.28N R.9W).

Cultural/Historical Values. The drainage was used extensively by prehistoric Native Americans. During World War II several chrome mines were developed within the drainage, but they were abandoned at the end of the war.

Fisheries. The stream supports a population of native rainbow trout. Holding and rearing habitat for anadromous fisheries is found in the lower reaches of the creek. However a waterfall located about three miles above the Highway 36 crossing prevents migration into the upper reaches of the stream.

Geology. The stream is free-flowing with numerous pools and riffles. In Beegum Gorge proper, the stream is incised in bedrock and is very rugged and scenic. Above Beegum Creek Campground, side slopes are primarily serpentinized soils but the stream channel is relatively stable. Elevations range from about 1,300 feet at the Highway 36 crossing to about 3,900 feet at Forest Road 28N10.

Land Ownership. Above the Highway 36 crossing, the stream flows through lands administered by the Bureau of Land Management, the U.S. Forest Service, and through a small portion of private property.

Management Activities. Local economies are dependent primarily on Federal and State programs, recreation, retirement, grazing, and hunter recreation.

Recreation. Due to limited access, recreation use in the drainage is light. There are a few opportunities for camping, picnicking, swimming, and fishing.

Socio-economic. The socio-economic focus is revenues generated from Federal and State employment, recreation, retirement, and revenues generated from timber harvest and cattle grazing allotments on Federal lands.

Vegetation. Vegetation along the proposed corridor is varied. At the lower elevations, it ranges from chaparral brushfields through stands of gray pine and oaks with associated brush species, and stands of Jeffrey pine. Stands of mixed conifer are at the higher elevations. Cottonwood, California laurel, and alder grow along the creek bottom and wet drainages.

Visual Quality. The entire drainage is classed as Variety Class B and Sensitivity Levels 3 and 4.

Water. Water quality is good.

Wildlife. Due to the wide variety of habitats, numerous wildlife species live in this drainage. The lower elevations are also important black-tail deer winter range.

Canyon Creek

Segment 1, from the confluence with the mainstem Trinity River, near Junction City, to the trailhead at Ripstein boundary, measures 15 miles in length. Segment 2, from the Trinity Alps Wilderness boundary to the headwaters, is 6.5 miles long.

Cultural/Historical Values. The area was used by prehistoric Indians. It also has evidence of historic gold mining.

Fisheries. Canyon Creek supports steelhead, salmon, and rainbow trout in Segment 1, and trout only in Segment 2.

Geology. Both segments meet the free-flowing condition. However, the lower segment has an old water diversion dam which has been partially removed. A history of mining has altered the streamcourse though much of the evidence was altered during the 1964 flood.

Land Ownership. Canyon Creek flows primarily through National Forest land. There are some small, scattered private parcels as well.

Management Activities. The local economy is based on timber harvesting, mining, and related support.

Recreation. The area has high dispersed recreation values with moderate amounts of hunting, hiking, fishing, and dispersed camping.

Socio-economic. Mining, recreation and timber production formed the socio-economic framework of the area in the recent past. Today, roughly half of the watershed is within the Trinity Alps Wilderness. Recreation, in the form of hiking, camping, fishing and hunting, is the dominant socio-economic activity.

Vegetation. The stream corridor supports mixed conifer and hardwood stands. Generally, the corridor is classified as moderate to highly suitable for timber management.

Visual Quality. The visual quality inventory classifies the corridor as Variety Class A and Sensitivity Level 1.

Water. Water quality is excellent.

Wildlife. A variety of wildlife lives in the area, including game species such as black bear, black-tailed deer, and many non-game species.

Hayfork Creek

The 14-mile segment of Hayfork Creek is located approximately 6 miles west of the town of Hayfork. The study segment begins at a crossing known as 9 Mile Bridge and flows through a steep canyon with side slopes up to 70 percent.

Cultural/Historical Values. The drainage was heavily used by prehistoric Indians. The area also has evidence of an early history of gold mining.

Fisheries. Hayfork Creek supports steelhead, salmon, and inland rainbow trout. Overall, the steelhead and rainbow trout populations are moderate to high.

Geology. The creek is free-flowing with numerous pools and riffles. Drafting of water for irrigation in the Hayfork Valley contributes to low summer flows though this condition improves downstream as the number of tributaries increases. Portions of the streamcourse have reached bedrock and are rugged and scenic. Soils are generally highly erodible within the watershed. Earthflows are evident in several of the tributary watersheds.

Land Ownership. Hayfork Creek flows primarily through National Forest land. There are a few small, scattered private parcels.

Management Activities. The local economy is dependent on timber harvesting, mining, and related support.

Recreation. The area has moderate recreational values with light to moderate amounts of hunting, hiking, dispersed camping, and boating. Fishing potential is high for steelhead and trout.

Socio-economic. Mining and the harvest of timber provides the socio-economic focus in the area. Increasingly, however, social values emphasing water quality, scenic and wildlife amenities are moderating the economic focus.

Vegetation. Both sides of Hayfork Creek support scattered stands of mixed conifer and hardwood. Generally the corridor is classified as unsuitable or low suitability for timber management on the south-facing slopes and moderate to high suitability on the north-facing slopes.

Visual Quality. The drainage is inventoried as Variety Class A and Sensitivity Level 2.

Water. Water quality is good during high and moderate flows. During low flows, water quality is questionable due to increased temperatures and associated algae growth. As tributaries with colder water merge with Hayfork Creek, the water quality improves. Quality is considered good below the confluence with Corral Creek even during low flow conditions.

Wildlife. Wildlife includes game species such as black bear, black-tailed deer, and many non-game species.

McCloud River (Upper and Lower)

The McCloud River is located northeast of Redding with headwaters near Deadhorse Summit in Siskiyou County. The first five mile segment has such a low flow that it is not recommended for inclusion in the Wild and Scenic Rivers System. It flows southwest with its terminus at Shasta Lake. The upper portion of this river flows through National Forest lands, with the remainder flowing primarily through private ownership.

Cultural/Historical Values. This entire drainage was heavily used by prehistoric Indian tribes. Numerous well preserved Indian village sites, remnants of late 1800 and early 1900 resorts, and early logging still remain along the river.

Fisheries. Excellent fishing opportunities exist along this segment. It is a premium trout stream, containing the

habitat of the redband trout, bull trout (Dolly Varden), and the rainbow trout. The McCloud River rainbow trout has been transplanted all over the world. The McCloud River has been classified as a blue ribbon trout fishery.

Geology. The upper five mile segment of the river, starting at Deadhorse Summit, has a very minimal flow and no outstanding features. Beyond the initial five miles, the river meanders through a gently rolling, forested plateau with interspersed meadows and several popular campgrounds. The river descends into a heavily forested canyon below a series of picturesque waterfalls. Big Springs, a unique volcanic geologic feature, increases river flow below the falls.

Land Ownership. The Upper McCloud River flows primarily through National Forest land. About 15 miles of the 24 mile segment are on National Forest land. The Lower McCloud River flows primarily through private land with only about 6 miles of the 23 mile segment on National Forest land.

Management Activities. Timber harvesting and recreation are the prime uses which add to the economics of nearby communities and the region. The water is of prime importance for downstream power generation at Shasta Dam, and for irrigation in the Sacramento Valley. Nationally significant fishing opportunities are also available, but public access is restricted by private land ownership.

Recreation. Recreation use has been light. There are excellent opportunities for development of camping and picnicking sites. The area is highly suitable for development of hiking and equestrian trails. In recent years there has been increasing interest in whitewater rafting. Fishing is popular but restricted, as are other potential activities, because of the private land ownership.

The Upper McCloud, from Lower Falls to McCloud Lake, is suitable for whitewater boating year-round due to heavy flows from adjacent springs. The Lower McCloud is suitable for whitewater boating for a month or two in the spring following winter snow melt. During this period of time, fishing is poor due to the high water levels.

Socio-economic. The socio-economic emphasis within the McCloud River watershed includes timber growth and harvest, the protection and enhancement of certain pristine private lands, the production of hydroelectric power, and downstream irrigation. Recreation use is more of a perception of an opportunity rather than a reality because of access restrictions related to terrain and private land ownership.

Vegetation. Vegetation along the entire upper portion of the McCloud River is primarily of a mixed conifer type, with scattered manzanita in the dryer sites and openings. Willow and alder are found along the river bank.

Visual Quality. Visual quality within the foreground of this watercourse is Variety Class A. Some timber harvesting can be observed near the river from time to time, but most activity occurred earlier in the century. The entire segment has been classified as highly sensitive visual quality (Sensitivity Class I).

Water. Water quality in the McCloud River is generally good but is marginal for drinking without treatment. The large influx of underground water at Big Springs increases the size of the river tenfold.

Wildlife. This river contains a multitude of wildlife that are associated with a mixed conifer forest. Black-tail deer, mule deer, and black bear are common sights along the river. There have been two sightings of wolverine. Bald eagles and various species of ducks can be seen in and adjacent to the water.

North Fork Trinity River

The North Fork Trinity River is located northwest of Weaverville in the western portion of Trinity County. The study segment begins in the Trinity Alps Wilderness along the Salmon Mountains and ends near the trailhead at Hobo Gulch.

Cultural/Historical Values. The area has an early history of gold mining with many relics of old townsites and cabins.

Fisheries. The river supports native trout and anadromous fisheries (salmon and steelhead).

Geology. This river is a free-flowing stream with numerous pools and riffles. The streamcourse is incised in bedrock and is very rugged and scenic. Side slopes are unstable, with large landslide areas along portions of the channel.

Land Ownership. This river is entirely within National Forest land.

Management Activities. The local economy is dependent on timber harvesting, tourism, and recreationists within the Trinity River drainage.

Recreation. The area has high recreational values with significant amounts of hunting, fishing, hiking, and camping occurring throughout the drainage.

Socio-economic. The North Fork Trinity River is primarily in the Trinity Alps Wilderness. The social-economic focus is mostly related to amenity wilderness values, although the economic value of the salmon and steelhead fisheries is significant.

Vegetation. Both sides of the river are heavily forested with stands of Douglas-fir. The soils are shallow and growing conditions are marginal.

Visual Quality. The entire drainage is classed as Variety Class A and Sensitivity Level 2.

Water. Water quality is good.

Wildlife. Numerous wildlife species live in the area including black-tail deer and black bear.

South Fork Trinity River

This river is located west of Weaverville and Hayfork in the southwest portion of Trinity County. The 25-mile study segment begins at the headwaters of the South Fork of the South Fork Trinity River in the Yolla Bolly-Middle-Eel Wilderness and ends at the Highway 36 bridge at Forest Glen.

Cultural/Historical Values. Several old homesteads can still be found; they provide good examples of lifestyles in the mid-1800s. Some prehistoric sites are evident. No thorough inventory of the drainage has been completed.

Fisheries. The river provides important habitat for anadromous fish. The South Fork Trinity has been identified as a Model Steelhead Stream Demonstration Project which demonstrates the compatibility of fisheries and resource management.

Geology. This gradually sloping river flows through extremely unstable areas. Large pool and riffle sections dominate the upper river. The lower river has rather wide floodplains and infilled pools as a result of the 1964 flood.

Land Ownership. The river runs primarily through National Forest land. Numerous small private land parcels are intermingled.

Management Activities. Local communities count on the revenues derived from timber harvesting, ranching, and recreation within this watershed.

Recreation. The river is used primarily for fishing, hunting, and camping. Several developed campgrounds and 11 summer homes are located in the area. The South Fork Trinity National Recreation Trail (NRT) parallels the river for nine miles.

Socio-economic. The South Fork Trinity River features diverse socio-economic factors featuring timber management, anadromous fisheries, ranching, and recreation. Conflicting social values are most often underscored by land use decisions, especially those related to timber management activities. The area is lightly populated but generates attention from environmental and industrial organizations far removed from its boundaries.

Vegetation. Both sides of this river support large stands of older over-mature Douglas-fir, except in areas close to old homesteads.

Visual Quality. The entire length of this river has been inventoried as Variety Class A and Sensitivity Level 1.

Water. A decline in water quality for anadromous fish habitat has resulted primarily from past natural events, such as the 1964 flood.

Wildlife. Many species of wildlife live in the area. Black-tail deer, black bear, spotted owls, and bald eagles are common.

Sacramento River (Segment 1)

The Sacramento River is located north of Redding. The portion under consideration begins at the Box Canyon Dam and flows south to a terminus at the boundary of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA).

Cultural/Historical Values. The entire drainage was heavily used by prehistoric Indians.

Fisheries. The river is a premium stream for rainbow trout.

Geology. The river is free-flowing below the Box Canyon Dam with numerous sequences of rapids and pools. Though an interstate highway, a railroad, and powerlines parallel the steep sided canyon walls, the heavily forested streamsides and rock outcrops screen the majority of obtrusive features and combine to form a very picturesque river corridor.

Land Ownership. The Sacramento River flows through scattered public lands. Only about 6 miles of the 37 mile segment are on National Forest land.

Management Activities. Transportation corridors and recreation are the prime uses which add to the economics of nearby communities. The water is of prime importance for downstream power generation at Shasta Dam and for irrigation in the Sacramento Valley. Nationally significant fishing opportunities are also available, but public access is limited by private land ownership.

Recreation. Recreation use has been light to moderate. There are a few limited opportunities for camping and picnicking. In recent years there has been increasing

interest in whitewater rafting. Fishing is popular but restricted because of very limited access.

Socio-economic. The vast majority of the Sacramento River is in private ownership and, therefore, there is little socio-economic effect related to Forest Service land management decisions. The river canyon includes a major north-south highway (Interstate 5), a rail, and a power transmission line corridor through the Pacific Coast states from Washington to Southern California. The Sacramento River is one of the major rivers providing water resources for the California Central Valley Project, one of the largest power and irrigation projects in the world.

Vegetation. Vegetation is primarily a mixed conifer/hardwood type, with scattered manzanita in the dryer sites and openings. Willow and alder are found along the river bank.

Visual Quality. Visual quality within the foreground of the watercourse is Variety Class A. Some of the cut and fill banks for Interstate 5 and the railroad are evident for short durations. In addition, some the railroad bridges constructed in the early 1900s are also evident. The entire segment has been inventoried as highly sensitive visual quality (Sensitivity Class 1).

Water. Water quality in the Sacramento River is generally good but marginal for drinking without treatment. Highway spills and municipal sewage systems have caused periodic short-term pollution problems.

Wildlife. This segment contains a variety of wildlife associated with the vegetation type. Black-tail deer and bear are common sights along the river. Bald eagles and various species of ducks can be seen in and adjacent to the water.

Sacramento River (Segment 2)

North Fork

Mileage. Six miles from the headwaters to South Fork Road.

Cultural/Historical Values. The area was used as a transportation corridor for prehistoric populations. The historic Sisson-Callahan National Recreation Trail (NRT) follows this drainage. Historic railroad logging occurred in this area during the first two decades of the 20th Century.

Fisheries. The North Fork Sacramento River is an important water quality stream and contains a healthy population of inland rainbow trout.

Geology. This segment is free-flowing to Lake Siskiyou; it has numerous pools and riffles. Streamcourses are incised to bedrock, moderately rugged, and scenic. Side slopes and channels are moderately stable. The entire watershed is underlaid by ultramafic rock.

Land Ownership. The North Fork of the upper Sacramento River flows predominantly through National Forest land.

Management Activities. Most of the stream corridor falls within a habitat conservation area for the northern spotted owl. Activities include low to moderate timber harvesting, mining, and hiking along the Sisson-Callahan NRT.

Recreation. Most recreation use in this area is associated with the Sisson-Callahan NRT. Equestrian use, hiking, mountain biking, and hunting take place.

Socio-economic. Recreation, mining, and timber production represent the primary socio-economic values of the area. Current trends suggest that an increase in recreational activity is possible.

Vegetation. Mixed conifer stands dominate the stream corridor.

Visual Quality. Variety Class B with Sensitivity Levels 1-3.

Water. Water quality is good during high and moderate flows. Recreation use and grazing may affect water quality during low flows.

Wildlife. There is a variety of wildlife in the area including game species such as black bear, black-tailed deer, and many nongame species. Bald eagles and osprey are found adjacent to and above Lake Siskiyou.

Middle Fork

Mileage. 5.4 miles from Toad Lake to South Fork Road.

Cultural/Historical Values. The area was used intensively as a transportation corridor for prehistoric populations.

Fisheries. The Middle Fork Sacramento River is an important contributor of good quality water to the South Fork Sacramento River. It supports a fairly good population of inland rainbow trout.

Geology. This segment is free-flowing to Lake Siskiyou; it has numerous pools and riffles. Streamcourses are incised to bedrock, moderately rugged, and scenic. Side slopes and channels are moderately stable. The entire watershed is underlaid by ultramafic rock.

Land Ownership. The Middle Fork of the upper Sacramento River flows through National Forest land.

Management Activities. The area is characterized by moderate timber harvesting and minimal recreation development.

Recreation. This area offers excellent opportunities for hiking, dispersed camping, mountain biking, hunting, and backcountry skiing.

Socio-economic. Recreation and timber production represent the primary socio-economic values of the area. Current trends suggest that an increase in recreational activity is possible.

Vegetation. Mixed conifer stands dominate the stream corridor.

Visual Quality. Variety Class B with Sensitivity Levels 1-3.

Water. Water quality is good during high and moderate flows. Recreation use and grazing may affect water quality during low flows.

Wildlife. There is a variety of wildlife in the area including game species such as black bear, black-tailed deer, and many nongame species. Bald eagles and osprey are found adjacent to and above Lake Siskiyou.

South Fork

Mileage. 10.4 miles from Gumboot Lake to Lake Siskiyou (10.2 miles are National Forest land; 0.2 mile is private land).

Cultural/Historical Values. This area was used intensively as a transportation corridor by prehistoric populations and probably served as a major connecting route between the upper Sacramento and upper Trinity watersheds.

Fisheries. The South Fork Sacramento River is an important water quality stream and contains brook trout and rainbow trout. The stream is stocked regularly during the summer with catchable rainbow trout.

Geology. This segment is free-flowing to Lake Siskiyou; it has numerous pools and riffles. Streamcourses are incised to bedrock, moderately rugged, and scenic. Side slopes and channels are moderately stable. The entire watershed is underlaid by ultramafic rock.

Land Ownership. The majority of the stream corridor is on National Forest land. There are small private land parcels at Cliff Lake and near Lake Siskiyou.

Management Activities. Recreation and timber harvesting represent the main activities in this area.

Recreation. This area represents a major recreation corridor. There is access to hiking, fishing, hunting, dispersed camping, Castle Crags Wilderness trailheads, the Pacific Crest National Scenic Trail (PCT), and numerous lakes along the Trinity Divide.

Socio-economic. Recreation and timber production represent the primary socio-economic values of the area. Current trends suggest that an increase in recreational activity is possible.

Vegetation. The stream corridor is characterized by mixed conifer stands.

Visual Quality. Variety Class B with Sensitivity Levels 1-3.

Water. Water quality is good during high and moderate flows. Recreation use and grazing may affect water quality during low flows.

Wildlife. There is a variety of wildlife in the area including game species such as black bear, black-tailed deer, and many nongame species. Bald eagles and osprey are found adjacent to and above Lake Siskiyou.

Squaw Valley Creek

This creek is located northeast of Redding, with headwaters in an alpine meadow. The first 10 miles of the upper segment, which terminate at the town of McCloud, have such a low flow that they are not recommended for inclusion in the Wild and Scenic Rivers System.

The next 9 mile segment, or middle segment, from McCloud to the confluence of Cabin Creek, traverses a rural residential and pasture land area. Again, since the flow is relatively low and there are no remarkably outstanding features, this second segment is not recommended for inclusion in the Wild and Scenic Rivers System.

The lower segment travels 10.5 miles from the confluence of Cabin Creek to the confluence with the McCloud River.

Cultural/Historical Values. This entire drainage was used by prehistoric Indian tribes.

Fisheries. There are excellent native trout fishing opportunities along this segment.

Geology. The upper river is of low gradient. The middle and lower reaches are incised in bedrock and have interspersed pools and rapids.

Land Ownership. The lower segment flows through approximately 10 miles of public land and one-half mile of private land (located near the confluence with the McCloud River).

Management Activities. Timber harvesting and recreation are the primary uses which add to the economy of nearby communities. The water is important for recreation as well as downstream power generation and irrigation uses.

Recreation. Recreation use has been very light. Land access is available via cross-country hiking for the first 3.5 miles from the PCT bridge crossing just below the confluence of Cabin Creek. The next 7 miles are generally paralleled by a narrow dirt road with infrequent motorized use. At present, this road is not open to motorized use.

There are excellent recreation opportunities for public use. The area is highly suitable for most semi-primitive non-motorized and motorized recreation experiences. There are also some excellent opportunities for roaded natural recreation activities. Based on flow levels and current technology, the stream is only marginally suitable for whitewater rafting.

Socio-economic. Squaw Valley Creek is tributary to the McCloud River and the primary socio-economic interests are timber harvesting and recreation. Aesthetic and biological values strongly influence management decisions in the area.

Vegetation. Vegetation along this segment is primarily a mixed conifer type with scattered manzanita in the dryer sites and openings. Willow and alder are found along the stream bank.

Visual Quality. Visual quality within the foreground of this watercourse is Variety Class A. The entire segment has been classified as moderate visual sensitivity (Sensitivity Class II).

Water. Water quality in Squaw Valley Creek is generally good but marginal for drinking without treatment.

Wildlife. This segment contains a multitude of wildlife that are associated with a mixed conifer forest. Black-tail deer and black bear are common sights along the creek. Bald eagles and various species of ducks can be seen in and adjacent to the stream.

Virgin Creek

This 11-mile-long river is located within the Trinity Alps Wilderness. It is a tributary of New River, which is classified as a part of the National Wild and Scenic Rivers System. It is located on the western edge of Trinity County.

Cultural/Historical Values. The area has a past history of early California gold mining.

Fisheries. The river supports native trout and anadromous fish (salmon and steelhead).

Geology. The study area is in a primitive condition and includes a free-flowing stream with numerous small rapids, falls, and pools. It flows in a southerly direction beginning on the upper slopes of Salmon Mountain and terminating in the New River. The streamcourse is incised in bedrock and is quite rugged and scenic.

Land Ownership. Land is in National Forest ownership.

Management Activities. The local economy in the area has been dependent on timber, mining, recreation, and, in the past, illegal cannabis growing. Cannabis growing has decreased dramatically as resource management activities have increased.

Recreation. Recreation activities in the Virgin Creek drainage have been restricted for the past few years due to illegal cannabis growing. Management efforts have eliminated this conflict, and the area is again open to the public. The primary recreation activities are fishing, hiking, and equestrian use.

Socio-economic. Virgin Creek is totally within the Trinity Alps Wilderness. The social-economic values are primarily related to the amenities of a wilderness environment, i.e., solitude, scenic quality, wildlife, fish, etc.

Vegetation. Vegetation varies from dense Douglas-fir stands to open grass areas. Southerly-facing slopes have many outcrops of brush.

Visual Quality. Visual resources include Variety Class A within the stream corridor and Sensitivity Level 1.

Water. Water quality is excellent. Old mining activities have had no long-term effect on water quality.

Wildlife. Numerous wildlife species are present in the area including black-tail deer and black bear.

C Evaluation Criteria for River Eligibility

The rivers analyzed in this appendix were identified in the Nationwide Rivers Inventory (NRI) and through the land management planning process as being potentially eligible for designation as part of the Wild and Scenic Rivers System. The eligibility of a river is determined by testing it against the requirements of Section 2(b) of the Wild and Scenic Rivers Act, as supplemented by Guidelines for Evaluating Wild, Scenic, and Recreation River Areas Proposed for Inclusion in the National Wild and Scenic Rivers System, September 7, 1982.

A number of criteria is included in the Act and Guidelines. Among the most important are "free-flowing" and "outstandingly remarkable." These criteria were applied to the corridors of study rivers to determine the presence of any special values or features. **Tables E-1** and **E-2** describe these values and features for each study river.

An analysis was conducted in order to determine the eligibility/classification of each proposed wild and scenic river segment. **Table E-3** depicts the results of this analysis.

D Alternatives and Effects of Alternatives

Alternative PRF (Preferred Alternative)

Alternative PRF recommends classification of all or portions of five of the 11 study rivers. If approved by an Act of Congress, the free-flowing condition of these rivers would be assured. They include Beegum Creek, Hayfork Creek, North Fork Trinity River, South Fork Trinity River, and Virgin Creek. (See **Table IV-19.**)

Beegum Creek -- extends from the Forest boundary above State Highway (SH) 36 to Beegum Gorge. It includes 2.5 miles of river on National Forest land. It becomes the Bureau of Land Management (BLM) designation south of the Forest boundary.

Hayfork Creek -- includes 14.0 miles of river. About 2.5 miles are within private ownership and 11.5 miles are within National Forest land.

North Fork Trinity River -- extends the existing wild and scenic river into the Trinity Alps Wilderness. It includes 11.7 miles of river, all within National Forest lands.

South Fork Trinity River -- extends the existing wild and scenic river to its headwaters. It includes 26.3 miles of river. About 1.5 miles are within private ownership and 24.8 miles are within National Forest land.

Virgin Creek -- includes 11.7 miles of river, all of which are on National Forest land within the Trinity Alps Wilderness.

Approximately 62.2 miles of river (National Forest lands only) would be added to the National Wild and Scenic Rivers System under Alternative PRF as follows:

42.0 miles - Wild River

17.3 miles - Scenic River

2.9 miles - Recreation River

Water-oriented recreation and scenic qualty would be enhanced by designation. Resource management activities requiring river crossing, road access, and transmission rights-of-way would be curtailed within designated "wild" and "scenic" river segments. Water impoundments would be curtailed for all designated segments.

The Wild and Scenic Rivers Act authorizes acquisition of land or easements once a river is designated. However, land acquisition is authorized only on a willing seller basis. Easements can be acquired by the Federal government in lieu of fee acquisition. Assuming that private lands remain in private ownership, the State and County, along with the landowners, would be encouraged to cooperate in the planning and administration of the wild and scenic rivers.

Both the North Fork Trinity River and Virgin Creek recommendations, if approved by Congress, would extend wild and scenic river classification into the Trinity Alps Wilderness. Such classification would provide specific prohibition against the damming of these rivers within the Wilderness.

Vegetative manipulation, for the purposes of improving timber yields or wildlife habitat, would be most constrained in river areas designated "wild" or "scenic". River areas with a "recreation" designation allow more opportunities for wildlife and timber management, provided the river values for which the rivers were designated are protected or enhanced.

In general, land uses within the river areas which exist when the rivers are designated may be permitted to continue. However, new land uses must be evaluated for their compatibility with the laws, regulations and policies associated with legally designated wild and scenic rivers.

Restrictions on land use are greatest for "wild" river areas. Such rivers represent primitive vestiges of America accessible primarily by trail. Fewer restrictions on management

would be placed on "scenic" river areas. These areas, however, would remain largely undeveloped. "Recreational" river areas would have the least restrictions on management activities, and development, consistent with guidelines, could take place.

Alternative PRF does not recommend designation for Canyon Creek, the upper and lower McCloud River, the Sacramento River, and Squaw Valley Creek. The effects of this nondesignation are as follows:

1. Fisheries and water quality would be protected by doing no scheduled timber harvest within an average riparian management zone (RMZ) width of 350 feet on each side of creeks and rivers.

2. Dams or diversions could be proposed.

3. Legal mineral exploration and extraction would be allowed outside of wilderness boundaries. Within wildernesses exploration and extraction would be subject to valid existing rights.

4. In the remaining 1/4 mile river corridors outside of RMZs, timber harvest would be as permitted in the prescription being applied (see Alternative PRF map). This ranges from no scheduled timber harvest where the Semi-primitive Non-motorized (SPNM) prescription is applied to modified timber harvest where the Roaded Natural (RN) prescription is applied.

5. Older over-mature habitat would be retained within wildernesses and SPNM areas. However, this habitat would decline significantly within RN areas outside of RMZs.

6. A Coordinated Resource Management Plan has been developed between the Forest Service and private landowners along the lower McCloud to govern uses within the river corridor. (See Appendix N in the Proposed Forest Plan.)

Private landowners along the lower McCloud River would generally be satisfied with the recommendation for nondesignation, since they have voiced opposition to designation. Private landowners along the upper McCloud River have also objected to designation and would be dissatisfied with a recommendation for designation. However, there are many individuals and river interest groups who favor designation.

Alternatives RPA (1990 RPA Program Emphasis) and CUR (No Action/No Change)

Alternatives RPA and CUR do not recommend designation for any additional wild and scenic rivers. The effects of this nondesignation are as follows:

1. Fisheries and water quality would be protected for Alternatives RPA and CUR by doing minimal timber harvest within an average RMZ width of 350 feet on each side of creeks and rivers.

2. Dams or diversions could be proposed.

3. Legal mineral exploration and extraction would be allowed outside of wilderness boundaries. Within wildernesses exploration and extraction would be subject to valid existing rights.

4. In the remaining 1/4 mile river corridors outside of RMZs, timber harvest would be as permitted in the prescription being applied (see Alternative RPA and CUR maps). This ranges from no scheduled timber harvest where the SPNM prescription is applied to intensive timber harvest where the Timber Management (TM) prescription is applied.

5. Older over-mature habitat would be retained within wildernesses and SPNM areas. However, this habitat would decline slightly within Semi-primitive Motorized (SPM) areas and significantly within RN and TM outside of RMZs.

Private landowners along the upper and lower McCloud River would generally be satisfied with not recommending the river for wild and scenic river designation. Many individuals and river interest groups favoring a designation recommendation would be dissatisfied.

Alternative CBF (Citizens for Better Forestry)

Alternative CBF recommends designation of nine study rivers and a portion of another one. If approved by an Act of Congress, such designation would assure the free-flowing conditions of these rivers (see **Table IV-19**). They include:

Beegum Creek -- extends from the Forest boundary above SH 36 to Beegum Gorge. It includes 2.5 miles of river on National Forest land. It becomes the Bureau of Land Management (BLM) designation south of the Forest boundary.

Canyon Creek -- includes 21.5 miles of river. About 4.0 miles are in private ownership and 17.5 miles are National Forest land.

Hayfork Creek -- includes 14.0 miles of river. About 2.5 miles are in private ownership and 11.5 miles are National Forest land.

McCloud River -- includes 24.3 miles of the upper segment and 23.3 miles of the lower segment.

North Fork Trinity River -- includes 11.7 miles of river, all within National Forest land.

South Fork Trinity River-- includes 26.3 miles of river; 1.5 miles are in private ownership and 24.8 miles are within National Forest land.

Sacramento River -- includes:

Segment 1: 37.3 miles from Box Canyon Dam to the boundary of the Whiskeytown-Shasta-Trinity National Recreation Area;

North Fork: 6.0 miles above Box Canyon Dam from the headwaters at the Sission-Callahan Trail crossing to the confluence of South Fork;

Middle Fork: 5.4 miles from the headwaters of Toad Lake to the confluence of South Fork;

South Fork: 10.4 miles from the headwaters in the Gumboot Lake area to Lake Siskiyou.

Squaw Valley Creek -- includes 10.5 miles, all within National Forest land.

Virgin Creek -- includes 11.7 miles, all within National Forest land.

Approximately 116.6 miles (National Forest lands only) would be added to the National Wild and Scenic Rivers System, as follows:

56.8 miles - Wild River

25.1 miles - Scenic River

34.7 miles - Recreation River

Water-oriented recreation and scenic quality would be enhanced by designation. Resource management activities requiring river crossing, road access, and transmission rights-of-way would be curtailed for designated wild and scenic segments. Water impoundments would be curtailed for all designated segments.

The Wild and Scenic Rivers Act authorizes acquisition of land or easements once a river is designated. However, any future land acquisition is envisioned to be only on a willing seller basis. Easements can be acquired by the Federal government in lieu of fee acquisition. Assuming that private lands remain in private ownership, the State and County, along with the landowners, would be encouraged to cooperate in the planning and administration of the wild and scenic rivers.

In general, land uses within the river areas which exist when the rivers are designated may be permitted to continue. However, new land uses must be evaluated for their compatibility with the laws and regulations Lower associated with wild and scenic rivers.

Restrictions on land use are greatest for "wild" river areas. Such rivers represent primitive vestiges of America accessible primarily by trail. Fewer restrictions on management would be placed on "scenic" river areas. These areas, however, would remain largely undeveloped. "Recreational" river areas would have the least restrictions on management activities, and development, consistent with guidelines, could take place.

Vegetative manipulation, for the purposes of improving timber yields or wildlife habitat, would be most constrained, assuming all else is equal, in river areas classified "wild" or "scenic". River areas with a "recreation" classification allow more opportunities for wildlife and timber management, provided the river values for which the rivers were classified are protected or enhanced.

Private landowners along the upper and lower McCloud River would object to designation. Designation is favored by many individuals and river interest groups.

Table E-4 summarizes the significant impacts by alternative for each river.

Table E-1
Identification and Description of River Segments

River - Segment	Description	Length (miles)*	Status
Beegum Creek			
Main Fork	From Round Bottom to the Forest boundary in Section 5.	8.5 total. (2.5 NF Wild; 6.0 NF Recreation)	Managed under multiple use. Portion of river from Forest boundary to State Highway 36 on BLM was determined to be eligible for Wild by BLM. All NF land.
South Fork	From the headwaters of South Fork, Section 36 adjacent to Forest Road 28N36 to the confluence of Middle Fork, Section 6.	7.0 total. (7.0 NF Wild)	Managed under multiple use. All NF land.
Canyon Creek			
1	Trailhead at Ripstein to the confluence of the mainstem of the Trinity River.	15.0 total. (11.0 NF Recreation)	Managed under multiple use. Majority of area is NF land.
2	Trailhead at Ripstein to the headwaters in the Trinity Alps Wilderness.	6.5 total. (6.5 NF Wild)	Entire segment is within the Trinity Alps Wilderness.
Hayfork Creek			
1	Nine Mile Bridge to the confluence of the South Fork of the Trinity River.	14.0 total. (11.5 NF Scenic)	Managed under multiple use. Majority of the area is NF land.
McCloud River (upper)			
1-3	Bartle to McCloud Reservoir.	24.3 total. (14.7 NF Recreation)	Managed under multiple use. Majority of the area is NF land.
McCloud River (lower)			
4-10	McCloud Reservoir to Shasta Lake.	23.3 total. (4.3 NF Wild; 1.8 NF Scenic)	Small amount of area is NF managed under multiple use. Scenic quality maintained. Majority of area is private land.
North Fork Trinity River			
1	From headwaters in the Trinity Alps Wilderness to existing designated river.	11.7 total. (11.7 NF Wild)	Designated Trinity Alps Wilderness.

* - Total miles includes National Forest and private lands. However, the number of miles of private land is not broken down.
BLM - Bureau of Land Management
NF - National Forest

Table E-1 (continued)
Identification and Description of River Segments

River - Segment	Description	Length (miles)*	Status
South Fork Trinity River			
1-5	From headwaters of the South Fork Trinity River in the Yolla Bolly-Middle Eel Wilderness to Highway 36, Forest Glen.	26.3 total. (16.1 NF Wild; 5.8 NF Scenic; 2.9 NF Recreation)	Managed under multiple use outside of Yolla Bolly-Middle Eel Wilderness. Managed as Wilderness inside Yolla Bolly-Middle Eel Wilderness.
Sacramento River			
1	Box Canyon Dam to the boundary of Whiskeytown-Shasta-Trinity National Recreation Area.	37.3 total. (6.1 NF Recreation)	Small amount of area is NF land managed under multiple use. Scenic quality is protected. Majority of area is private land.
Sacramento River	**Above Box Canyon Dam**		
North Fork	From headwaters at the Sission-Callahan Trail crossing to the confluence of South Fork.	6.0 total. (6.0 NF Recreation)	Managed under multiple use. The upper 1/2 is located in the Mt. Eddy Further Planning Area. All NF land.
Middle Fork	From headwaters of Toad Lake to the confluence of South Fork.	5.4 total. (5.4 NF Recreation)	Managed under multiple use. All NF land.
South Fork	From headwaters in the Gumboot Lake area to Lake Siskiyou.	10.4 total. (10.2 NF Recreation)	Managed under multiple use. Majority of area is NF land.
Squaw Valley Creek			
1-2	Confluence of Cabin Creek to the confluence of the upper McCloud River.	10.5 total. (4.0 NF Wild; 6.0 NF Scenic)	Managed under multiple use. Small amount of private land near confluence with upper McCloud River.
Virgin Creek			
1	From headwaters within the Salmon Mountains of the Trinity Alps Wilderness to the confluence of New River.	11.7 total. (11.7 NF Wild)	Designated Trinity Alps Wilderness.
TOTAL MILES		**217.9 (Federal and Private land)** **151.2 (NF land)**	

Table E-2
Outstandingly Remarkable Values Summary

Beegum Creek	
Values	**Segments 1-2; 1**
Cultural/Historical	Pre-historic Indians and some mining.
Fisheries	Moderate populations of native rainbow trout. A waterfall outside the Forest boundary[1] prevents fish migrations into upper portions of the river.
Geology	* Rugged in gorge below the Forest boundary. Serpentinized soils above the Forest boundary with a stable stream channel.
Visual Quality/Scenery	Variety Class B; Sensitivity Levels 3 and 4.
Wildlife	Common.
Canyon Creek	
Values	**Segments 1-2**
Cultural/Historical	Prehistoric Indians and history of gold mining.
Fisheries	Moderate populations of steelhead, salmon and native trout.
Geology	Rugged, 70 percent (+) side slopes; unstable soils and past flooding have created landslides.
Visual Quality/Scenery	* Variety Class A; Sensitivity Level 1; rugged topography, access road parallels segment 1; some evidence of early mining in segment 1.
Wildlife	Common.
Hayfork Creek	
Values	**Segment 1**
Cultural/Historical	Prehistoric Indians and history of mining.
Fisheries	* Moderate to high populations of steelhead, salmon, and native rainbow trout.
Geology	Rugged, 70 percent (+) side slopes; unstable soils have created landslides.
Visual Quality/Scenery	* Variety Class A; Sensitivity Level 2; rugged topography, two road crossings; one residence evident; a few secondary roads terminate near streamside.
Wildlife	Common.

* Outstanding Remarkable Values.

1 The Bureau of Land Management (BLM) has identified this section of Beegum Creek as eligible for Wild River designation.

Table E-2 (continued)
Outstandingly Remarkable Values Summary

McCloud River		
Values	**Segments 1-3**	**Segments 4-10**
Cultural/Historical	Significant Indian encampment; cave.	* Large Indian encampments, historical settlements, remnants of late 1800 and early 1900 resorts.
Fisheries	* Home of redband trout.	* Nationally significant trout fisheries; Dolly Varden trout.
Geology	* Deep flat soils, waterfalls; Big Springs due to volcanic formations.	* Rock outcrops, waterfalls, pools.
Visual Quality/Scenery	* Variety Class A; headwaters, perennial stream, falls, camping, private homes, logging visible.	Rugged topography, low stream flow, falls.
Wildlife	Common.	Common.

North Fork Trinity River	
Values	**Segment 1**
Cultural/Historical	Remnants of old gold mining.
Fisheries	* Excellent native trout and anadromous fisheries.
Geology	Unstable sideslopes; gold deposits present.
Visual Quality/Scenery	* Variety Class A; spectacular views, rugged, waterfalls, pools.
Wildlife	Common.

South Fork Trinity River	
Values	**Segments 1-5**
Cultural/Historical	Remnants of old homesteads.
Fisheries	* Excellent anadromous fishery. Has been designated as a Model Steelhead Stream Demonstration Area because of habitat.
Geology	Very unstable sideslopes.
Visual Quality/Scenery	* Variety Class A; scenic stream, pools, rapids.
Wildlife	Common area for spotted owls and bald eagles.

* Outstandingly Remarkable Values.

Table E-2 (continued)
Outstandingly Remarkable Values Summary

Sacramento River	
Values	**Segment 1**
Cultural/Historical	Significant Indian encampments.
Fisheries	* Nationally significant trout and salmon fishery.
Geology	Rugged, waterfalls, pools, Box Canyon, Castle Crags.
Visual Quality/Scenery	* Variety Class A; rugged, waterfalls, pools, vegetation.
Wildlife	Common.
Values	**All Segments - Above Box Canyon Dam**
Cultural/Historical	The area was used as a transportation corridor by pre-historic populations and probably served as a major connecting route between the upper Sacramento and upper Trinity watersheds.
Fisheries	Important water quality stream containing inland rainbow trout. South Fork is stocked regularly during the summer months.
Geology	All segments are free-flowing to Lake Siskiyou with numerous pools and riffles. The streamcourses are incised in bedrock; moderately rugged and scenic. Side-slopes and channels are moderately stable. The entire watershed is underlaid by ultramafic rock.
Visual Quality/Scenery	Variety Class B, Sensitivity Levels 1-3.
Wildlife	Common area for spotted owls and bald eagles.
Squaw Valley Creek	
Values	**Segments 1-2**
Cultural/Historical	Prehistoric Indians.
Fisheries	* Native trout fisheries.
Geology	Rugged, waterfalls, pools, deep, flat soils.
Visual Quality/Scenery	* Variety Class A; rugged, waterfalls, pools.
Wildlife	Common.

* Outstandingly Remarkable Values.

Table E-2 (continued)
Outstandingly Remarkable Values Summary

Virgin Creek	
Values	**Segment 1**
Cultural/Historical	Remnants of old mining.
Fisheries	*Native trout and anadromous fisheries.
Geology	Rugged, waterfalls, unstable sideslopes, shallow soils.
Visual Quality/Scenery	*Variety Class A; rugged, waterfalls, pools.
Wildlife	Common.

* Outstandingly Remarkable Values.

Table E-3
Wild and Scenic Rivers Study - Eligibility/Classification Analysis

	Block 1 - Wild				Block 2 - Scenic			Block 3 - Recreation			Block 4 - All	
Qualifying Answers	Free of Impound-ments	Generally Inacces-sible except by Trail	Water-shed Shoreline Essential-ly Primi-tive	Waters Unpol-luted	Free of Impound-ments	Acces-sible in Places by Roads	Water-shed/ Shoreline Largely Un-developed	Readily Acces-sible by Road	Past Im-pound-ments or Diver-sions are Un-obtrusive	May have Develop-ment on Shoreline	Possesses Outstand-ingly Remark-able Resource Values	Classifi-cation/ Eligibility
Beegum Creek												
Main Fork												
Segment 1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Scenic
Segment 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Wild
South Fork												
Segment 1	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	No	No	Wild
Canyon Creek												
Segment 1	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Recreation
Segment 2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Wild
Hayfork Creek												
Segment 1	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	No	Yes	Scenic
McCloud River												
Segment 1	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Recreation
Segment 2	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Scenic
Segment 3	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Recreation
Segment 4	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Scenic
Segment 5	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Wild
Segment 6	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Scenic
Segment 7	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Wild
Segment 8	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Scenic
Segment 9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Wild
Segment 10	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Scenic
North Fork Trinity River												
Segment 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Wild

EXPLANATION: To qualify for Wild, there must be 4 yesses in Block 1; for Scenic, there must be 3 yesses in Block 2 and one yes in Block 4; for Recreation, there must be one yes in Block 3 and one yes in Block 4.

Table E-3 (continued)
Wild and Scenic Rivers Study - Eligibility/Classification Analysis

	Block 1 - Wild				Block 2 - Scenic			Block 3 - Recreation			Block 4 - All	
Qualifying Answers	Free of Impound-ments	Generally Inacces-sible except by Trail	Water-shed Shoreline Essential-ly Primi-tive	Waters Unpol-luted	Free of Impound-ments	Acces-sible in Places by Roads	Water-shed/ Shoreline Largely Un-developed	Readily Acces-sible by Road	Past Im-pound-ments or Diver-sions are Un-obtrusive	May have Develop-ment on Shoreline	Possesses Outstand-ingly Remark-able Resource Values	Classifi-cation/ Eligibility
South Fork Trinity River												
Segment 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Wild
Segment 2	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Scenic
Segment 3	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Wild
Segment 4	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Scenic
Segment 5	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Recreation
Sacramento River												
Segment 1	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Recreation
North Fork												
Segment 1	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Recreation
Middle Fork												
Segment 1	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Recreation
South Fork												
Segment 1	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Recreation
Squaw Valley Creek												
Segment 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Wild
Segment 2	Yes	No	No	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Scenic
Virgin Creek												
Segment 1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Wild

Table E-4
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers*

Beegum Creek

Resource	Alternative PRF	Alternative RPA	Alternative CUR	Alternative CBF
Recommended Designation	Yes, Segment 2 only.	No	No	Yes, Segment 2 only
Fisheries and Water Quality	Wild Segments, no effects.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Minerals	Open to exploration and extraction consistent with the law.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Timber	SPNM, no timber harvest; RN, modified timber harvest outside of RMZs.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Visual Quality and Recreation	ROS Class of SPNM, RN, R; VQO of R, PR, M, MM.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Wildlife	SPNM, older over-mature habitat would remain; RN, older over-mature habitat would decline slightly; R, older over-mature habitat would decline.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.

* See the last page of this table for abbreviated terms and meanings.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

Canyon Creek

Resource	Alternative PRF	Alternative RPA	Alternative CUR	Alternative CBF
Recommended Designation	No	No	No	Yes
Fisheries and Water Quality	Wilderness, no effect; RN has an average RMZ width of 350 feet on each side of the creek with no timber harvests. Dams or diversions could be proposed.	Wilderness, no effect; RN has an average RMZ width of 350 feet on each side of the creek with minimal timber harvest. Dams and diversions could be proposed.	Same as Alternative RPA.	Wild segment, no effect; Recreation segment has an average RMZ width of 350 feet on each side of the creek with no timber harvest. Dams or diversions not permitted.
Minerals	Open to legal mineral extraction outside of wilderness boundaries. Subject to valid existing rights within wilderness.	Same as Alternative PRF.	Same as Alternative PRF.	Wild segment, subject to valid existing rights, otherwise corridors are withdrawn from mineral entry. Recreation segment, open to exploration and extraction consistent with the law.
Timber	Wilderness, no timber harvest; RN modified timber harvest would occur outside of RMZs.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Visual Quality and Recreation	Wilderness, ROS class of P, VQO of P; RN ROS class of RN, VQO of PR.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Wildlife	Wilderness, older over-mature habitat would be retained; RN, older over-mature habitat outside of RMZs would decline significantly.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

Hayfork Creek				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	Yes	No	No	Yes
Fisheries and Water Quality	Average RMZ width of 350 feet on each side of the creek with no timber harvest. Dams and diversions could be proposed.	Average RMZ width of 350 feet on each side of the creek with minimal timber harvest. Dams and diversions could be proposed.	Same as Alternative RPA.	Average RMZ width of 350 feet on each side of the creek with no timber harvest. Dams or diversions not permitted.
Minerals	Open to exploration and extraction consistent with the law.	Same as Alterntive PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Timber	SPNM, no timber harvest. RN, modified timber harvest would occur outside of RMZs.	SPNM, no timber harvest. Modified timber harvest would occur in remaining areas outside of RMZs.	RN, modified timber harvest would occur outside of RMZs.	Scenic designation would allow minimal timber harvest outside of RMZs.
Visual Quality and Recreation	SPNM, ROS class of SPNM, VQO of R. RN, ROS class of RN, VQO of PR.	SPNM, ROS class of SPNM, VQO of R. Timber management, ROS class of RN, VQO of M.	ROS class of RN, VQO of PR.	SPNM, ROS class of SPNM, VQO of R. RN, ROS class of RN, VQO of PR.
Wildlife	SPNM, older over-mature habitat would be retained. RN, older over-mature habitat would decline significantly outside of RMZs.	Same as Alternative PRF.	Older over-mature habitat would decline significantly outside of RMZs.	Older over-mature habitat would decline slightly outside of RMZs.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

Upper McCloud River				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	No	No	No	Yes
Fisheries and Water Quality	Average RMZ width of 350 feet on each side of the river with no timber harvest. Dams or diversions not permitted.	Average RMZ width of 350 feet on each side of the river with minimal timber harvest. Dams or diversions could be proposed.	Same as Alternative RPA.	Same as Alternative PRF.
Minerals	Open to exploration and extraction consistent with the law.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Timber	Modified timber harvest would occur outside of RMZs.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Visual Quality and Recreation	ROS class of RN, VQO of PR.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Wildlife	Older over-mature habitat outside of RMZs would decline significantly.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

Lower McCloud River				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	No	No	No	Yes
Fisheries and Water Quality	Average RMZ width of 350 feet on each side of the river with no timber harvest. Dams or diversions could be proposed.	Average RMZ width of 350 feet on each side of the river with minimal timber harvest. Dams or diversions could be proposed.	Same as Alternative PRF.	Average RMZ width of 350 feet on each side of the river with no timber harvest. Dams or diversions not permitted.
Minerals	Open to exploration and extraction consistent with the law.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF except Wild segments are subject to valid existing rights; otherwise, corridors would be withdrawn from mineral entry.
Timber	SPNM, no timber harvest. SPM, minimal timber harvest outside of RMZs.	SPNM, no timber harvest. Modified timber harvest in remaining areas outside of RMZs.	Modified timber harvest would occur within areas outside of RMZs.	Same as Alternative PRF.
Visual Quality and Recreation	SPNM, ROS class of SPNM, VQO of R. SPM, ROS class of SPM, VQO of R.	SPNM, ROS class of SPNM, VQO of R. ROS class of RN, VQO of PR and M on remainder of area.	ROS class of RN, VQO of PR.	Same as Alternative PRF.
Wildlife	SPNM, older over-mature habitat would be retained. SPM, older over-mature habitat would decline slightly.	SPNM, older over-mature habitat would be retained. Older over-mature habitat would decline significantly in remainder of the area.	Older over-mature habitat would decline significantly outside of RMZs.	Same as Alternative PRF.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

North Fork Trinity River				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	Yes	No	No	Yes
Fisheries and Water Quality	No effect. Dams or diversions not permitted.	No effect. Dams or diversions could be built consistent with the Wilderness Act.	Same as Alternative RPA.	Same as Alternative PRF.
Minerals	Subject to valid existing rights; otherwise corridors would be withdrawn from mineral entry.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Timber	No timber harvest.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Visual Quality and Recreation	ROS class of P, VQO of P.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Wildlife	Older over-mature habitat would be retained.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

South Fork Trinity River				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	Yes	No	No	Yes
Fisheries and Water Quality	Wild segments, no effects. Recreation and Scenic segments, average RMZ width of 350 feet each side of the river and inner gorges with no timber harvest. Dams and diversions not permitted.	No timber harvest in inner gorges. Average RMZ width of 350 feet on each side of the river with minimal timber harvest. Dams and diversions could be proposed.	Same as Alternative RPA.	Same as Alternative PRF.
Minerals	Open to exploration and extraction consistent with the law except Wild segments are subject to valid existing rights; otherwise corridors are withdrawn from mineral entry.	Open to exploration and extraction consistent with the law.	Same as Alternative RPA.	Same as Alternative PRF.
Timber	Wild segments, no timber harvest. Scenic segments, minimal timber harvest. Recreation segments, modified timber harvest.	SPNM, no timber harvest. SPM, minimal timber harvest. RN, modified timber harvest.	Same as Alternative RPA.	Same as Alternative PRF.
Visual Quality and Recreation	Wild segments, ROS class of SPNM, VQO of R. Scenic segments, ROS of SPM, VQO of PR. Recreation segments, ROS of RN, VQO of PR.	SPNM, ROS class of SPNM, VQO of R. SPM, ROS class of SPM, VQO of PR. RN, ROS class of RN, VQO of PR.	Same as Alternative RPA.	Same as Alternative PRF.
Wildlife	Wild segments, retain older over-mature habitat. Scenic segments, habitat would decline slightly. Recreation segments, habitat would decline significantly.	SPNM, retain older over-mature habitat. SPM, habitat would decline slightly. RN, habitat would decline significantly.	Same as Alternative RPA.	Same as Alternative PRF.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

Sacramento River - Segment 1				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	No	No	No	Yes
Fisheries and Water Quality	Average RMZ width of 350 feet on each side of the river with no timber harvest. Dams and diversions not permitted.	Average RMZ width of 350 feet on each side of the river with minimal timber harvest. Dams and diversions could be proposed.	Same as Alternative RPA.	Same as Alternative PRF.
Minerals	Open to exploration and extraction consistent with the law.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Timber	Modified timber harvest would occur outside of RMZs.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Visual Quality and Recreation	ROS class of RN, VQO of PR.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Wildlife	Older over-mature habitat outside of RMZs would decline significantly.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

Sacramento River - all segments				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	No	No	No	No
Fisheries and Water Quality	No Effect. Dam exists at Lake Siskiyou below the three segments.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Minerals	Open to exploration and extraction consistent with the law.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Timber	Minimum timber harvest outside of RMZs located within HCAs.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Visual Quality and Recreation	ROS class of SPNM, SPM, RN; VQO of R, PR, M.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Wildlife	Older, over-mature habitat would be retained. Areas outside of HCAs would have a slight decline in habitat.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

Squaw Valley Creek				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	No	No	No	Yes
Fisheries and Water Quality	Wild segments, no effect. Scenic segment has an average RMZ width of 350 feet on each side of the creek with no timber harvest. Dams or diversions not permitted.	Average RMZ width of 350 feet on each side of the creek with minimal timber harvest. Dams or diversions could be proposed.	Same as Alternative RPA.	Same as Alternative PRF.
Minerals	Wild segments, subject to valid existing rights; otherwise corridors are withdrawn from mineral entry. Scenic segments, open to exploration and extraction consistent with the law.	Open to exploration and extraction consistent with the law.	Same as Alternative RPA.	Same as Alternative PRF.
Timber	Wild segments, no timber harvest. Scenic segments, minimal timber harvest outside of RMZs.	Modified timber harvest in areas outside of RMZs.	Modified timber harvest in areas outside of RMZs.	Same as Alternative PRF.
Visual Quality and Recreation	Wild segments, ROS class of P, VQO of P. Scenic segments, ROS class of SPM, VQO of R.	ROS class of RN, VQO of M.	ROS class of RN, VQO of PR.	Same as Alternative PRF.
Wildlife	Wild segments, retain older over-mature habitat. Scenic segments, older over-mature habitat would decline slightly outside of RMZs.	Older over-mature habitat would decline significantly outside of RMZs.	Same as Alternative RPA.	Same as Alternative PRF.

Table E-4 (continued)
Summary of Significant Impacts of Alternatives on Potential Wild and Scenic Rivers

Virgin Creek				
Resource	**Alternative PRF**	**Alternative RPA**	**Alternative CUR**	**Alternative CBF**
Recommended Designation	Yes	No	No	Yes
Fisheries and Water Quality	No effect. Dams or diversions not permitted.	No effect. Dams or diversions could be built consistent with the Wilderness Preservation Act.	Same as Alternative RPA.	Same as Alternative PRF.
Minerals	Subject to valid existing rights; otherwise corridors are withdrawn from mineral entry.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Timber	No timber harvest.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Visual Quality and Recreation	ROS class of P, VQO of P.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.
Wildlife	Older over-mature habitat would be retained.	Same as Alternative PRF.	Same as Alternative PRF.	Same as Alternative PRF.

Abbreviated Terms and Meanings:

HCAs = Habitat Conservation Areas

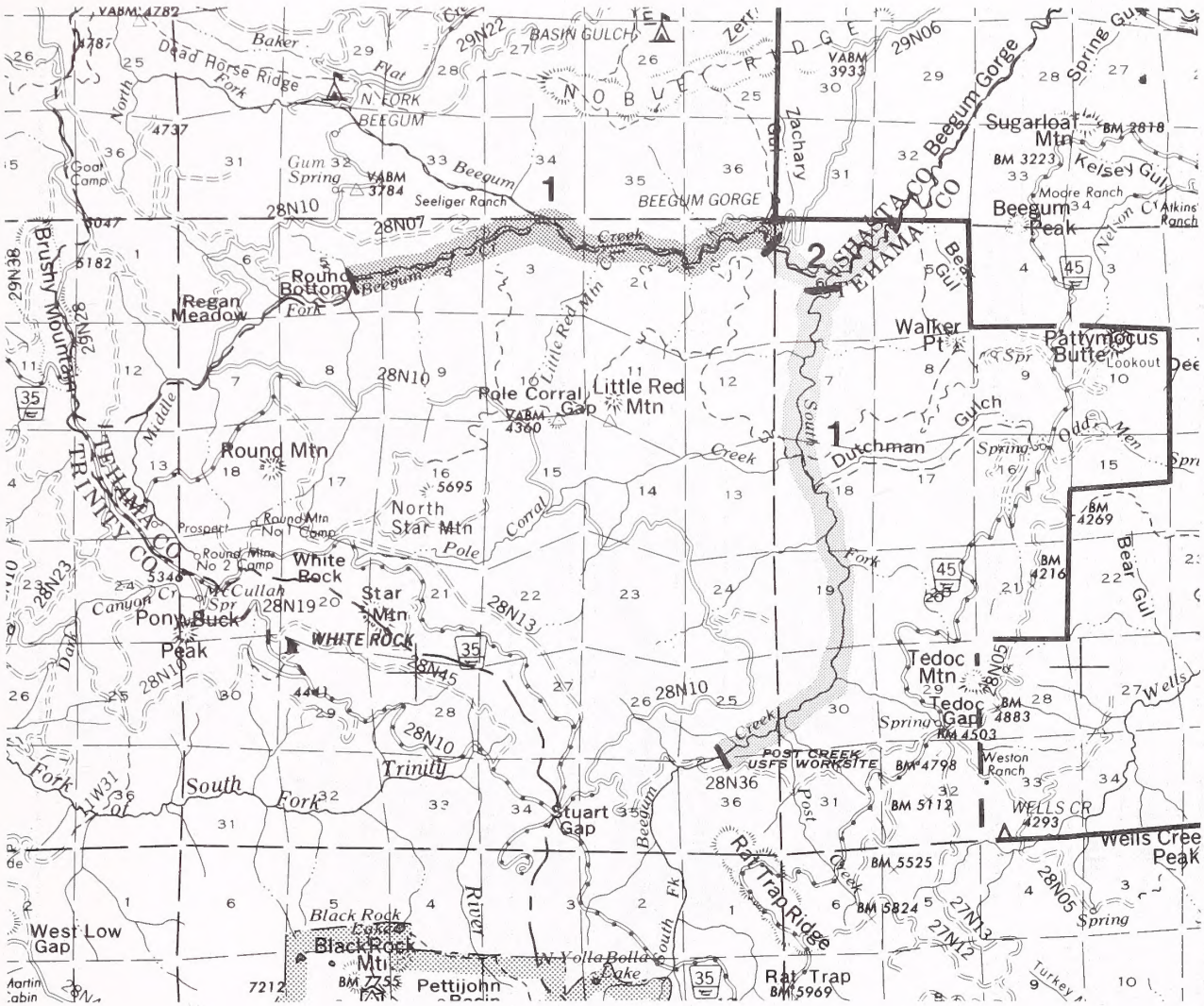
RMZ = Riparian Management Zone

ROS = Recreation Opportunity Spectrum

ROS Classes:
- P = Primitive
- SPNM = Semi-primitive Non-motorized
- SPM = Semi-primitive Motorized
- RN = Roaded Natural
- R - Rural

VQO = Visual Quality Objective

VQOs:
- P = Preservation
- R = Retention
- PR = Partial Retention
- M = Modification
- MM = Maximum Modification
- UM = Unacceptable Modification

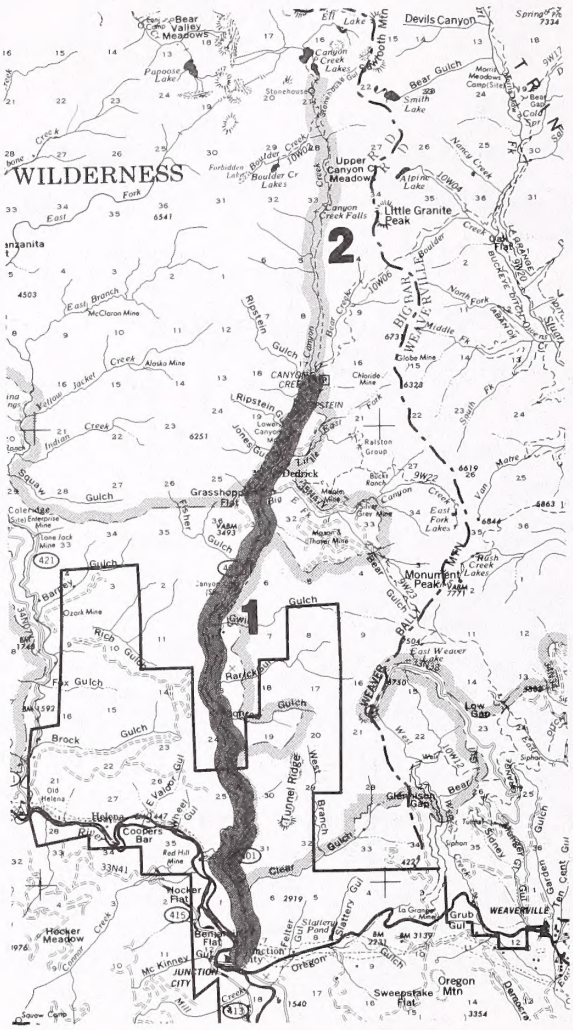


Wild & Scenic Rivers
BEEGUM CREEK

wild

Scenic

Recreation



Wild & Scenic Rivers
CANYON CREEK

Wild

Scenic

Recreation

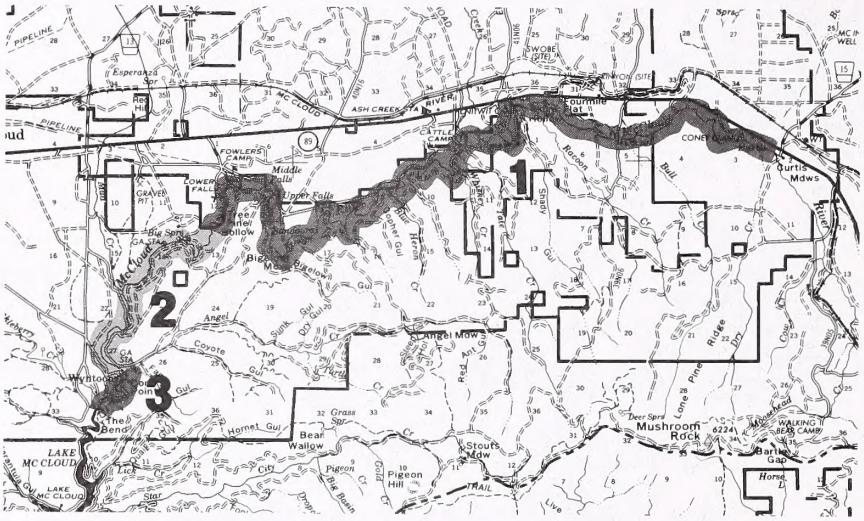


Wild & Scenic Rivers
HAYFORK CREEK

Wild

Scenic

Recreation



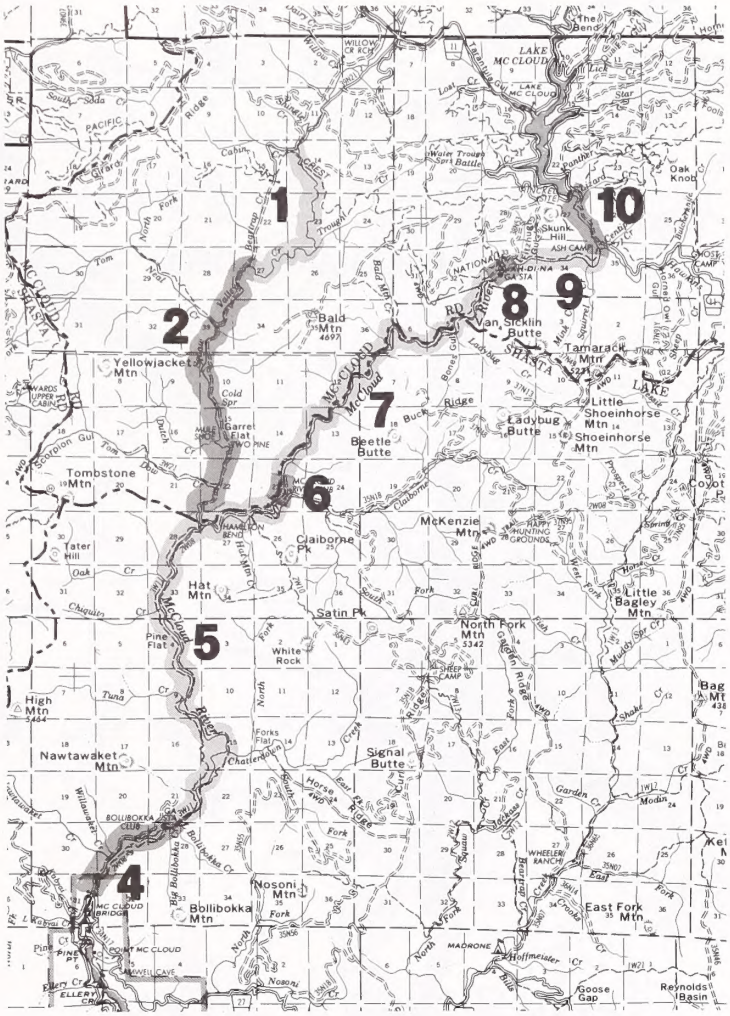
Wild & Scenic Rivers

UPPER McCLOUD RIVER

Wild

Scenic

Recreation



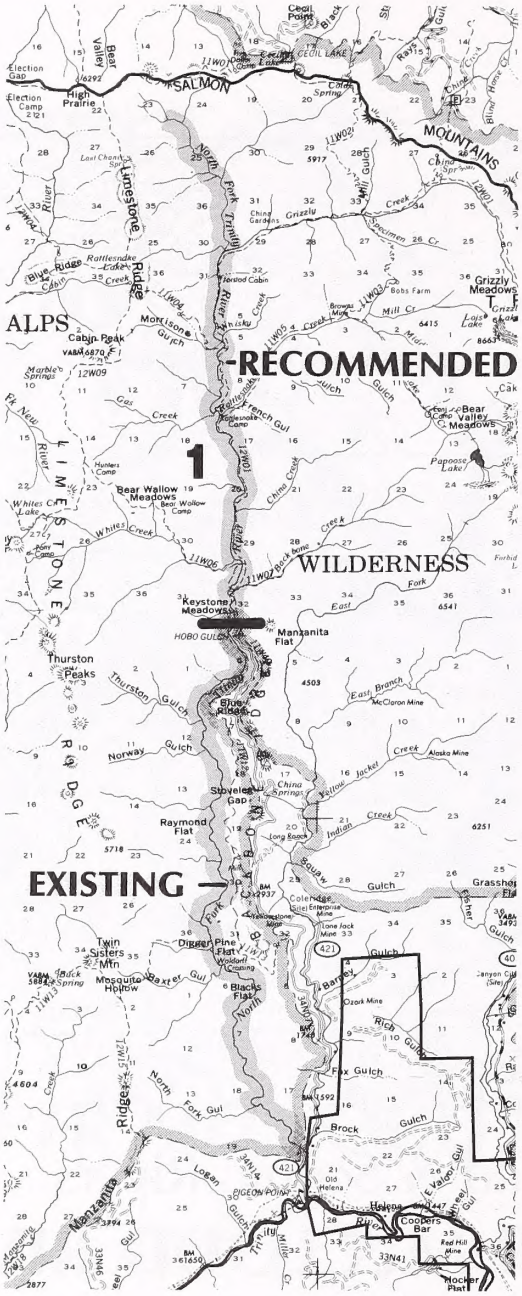
Wild & Scenic Rivers

LOWER McCLOUD RIVER & SQUAW VALLEY CREEK

Wild

Scenic

Recreation



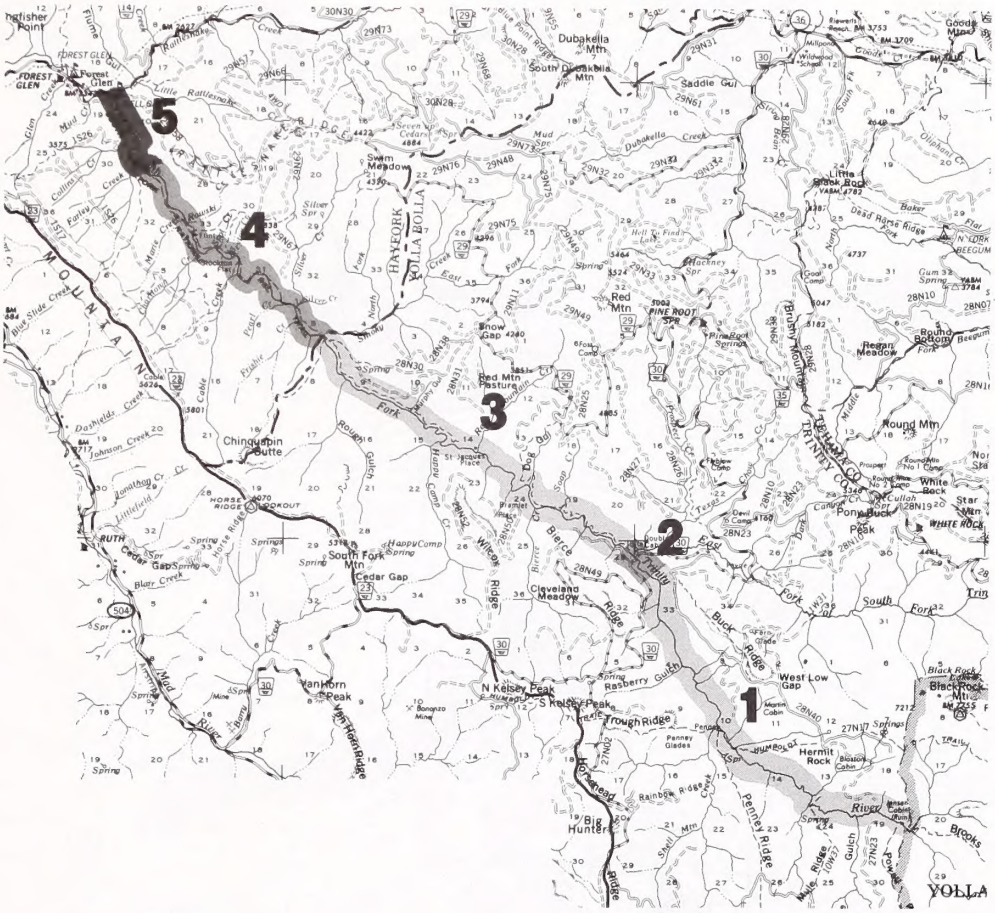
Wild & Scenic Rivers

NORTH FORK TRINITY RIVER

Wild

Scenic

Recreation



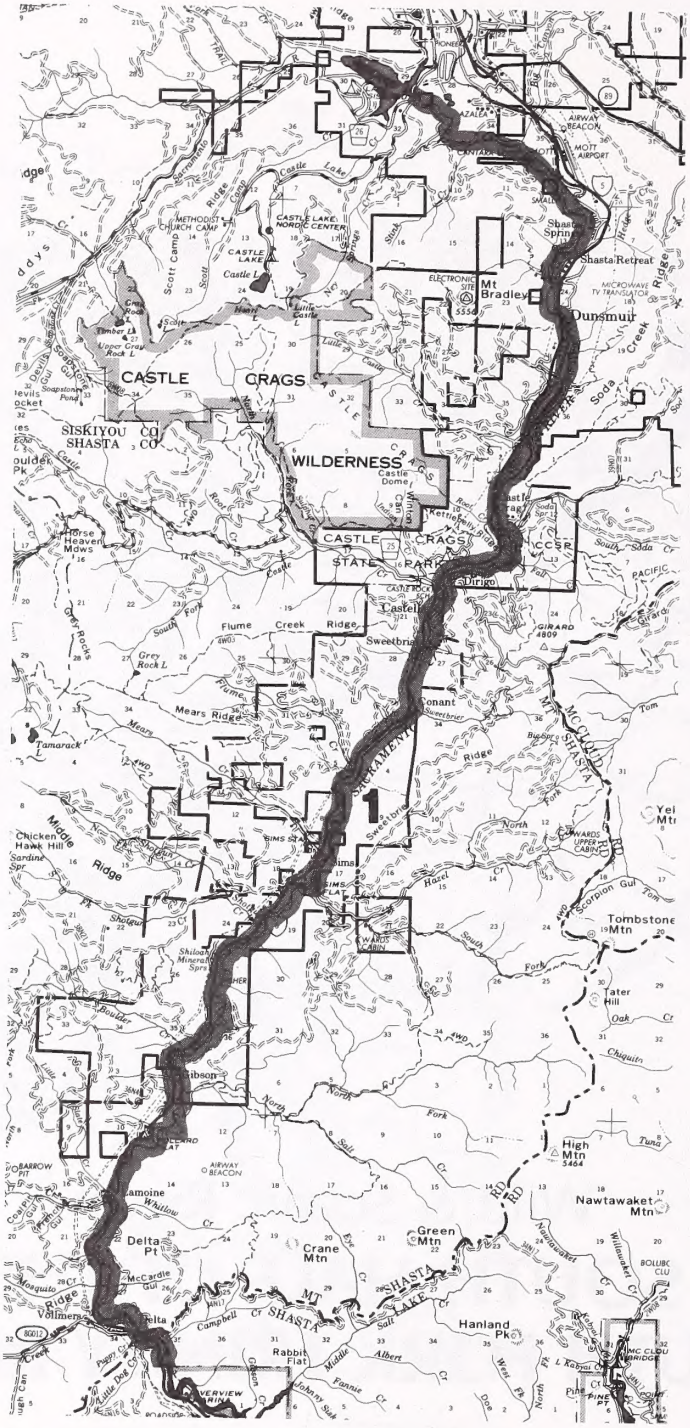
Wild & Scenic Rivers

SOUTH HALF OF THE SOUTH FORK TRINITY RIVER

Wild

Scenic

Recreation

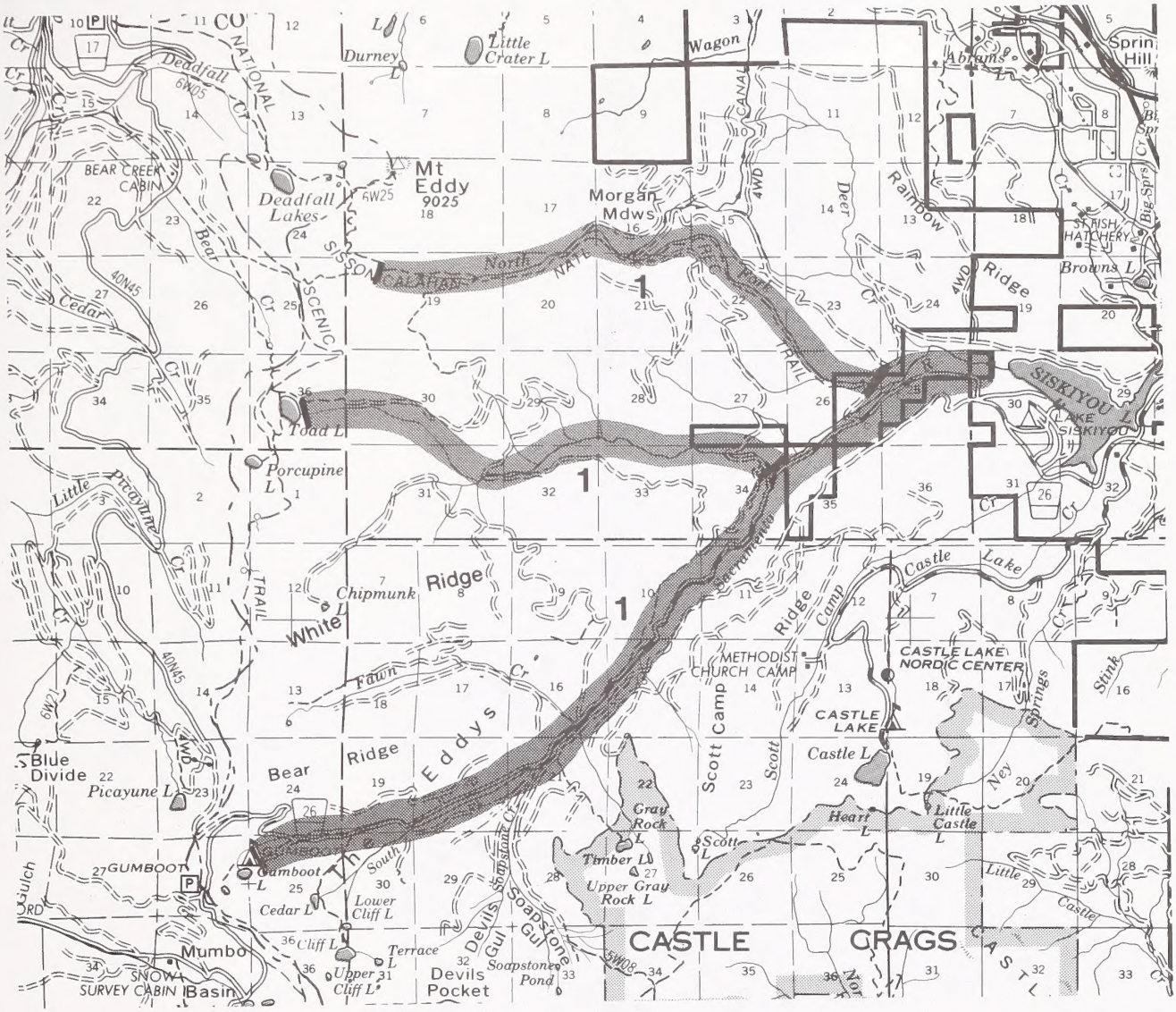


Wild & Scenic Rivers
SACRAMENTO RIVER

Wild

Scenic

Recreation



Wild & Scenic Rivers
SACRAMENTO RIVER

wild

Scenic

Recreation



Wild & Scenic Rivers

NEW RIVER & VIRGIN CREEK

Wild

Scenic

Recreation

APPENDIX F

Research Natural Area Analysis

APPENDIX F
Research Natural Area Analysis

One Research Natural Area (RNA) has been established on the Shasta-Trinity National Forests. The Shasta Mud Flow RNA was designated by the Chief of the Forest Service in 1971. It represents the young-growth Pacific ponderosa pine target (Society of American Foresters [SAF] type number 244)* for the Cascade Range Physiographic Province and the scientific geologic values of a volcanic mud flow.

Fourteen proposed candidate areas are in various stages of the screening and establishment process (Refer to Chapter III - Special Areas Section). These candidates will be addressed in the proposed Forest Plan and this Draft Environmental Impact Statement (Draft EIS) until the RNA committee completes its evaluation and the Regional Forester makes final recommendations.

Removal of candidate areas from the timber base will have an insignificant effect on timber outputs. Approximately 90 percent of the suitable timber acres would have been allocated to non-timber prescriptions in all the alternatives considered. Refer to Chapter IV for a detailed discussion of environmental consequences of RNA designation.

Scientific values of the candidate areas, with respect to Regional RNA network goals and present use and condition of these areas, are shown by **Tables F-1 and F-2**, respectively.

The target system described in Forest Service Manual (FSM) Title 4063, Pacific Southwest Region, Supplement No. 3, was used to determine vegetation elements in 11 physiographic provinces of California needed for representation in the RNA system. The Shasta-Trinity National Forests are located within parts of the Klamath Mountains, Cascade Range, and Modoc Plateau Physiographic Provinces. Personnel of the Shasta-Trinity National Forests are responsible for coordinating with the other Forests in these physiographic provinces and for nominating candidates representative of 34 desired elements.

Of the 34 elements, 8 constitute the main elements found in 14 proposed candidate areas. Eight other elements are also represented among the candidate RNAs, and three do not occur on the Forests (i.e., the three Baker Cypress targets). Refer to **Table F-1** "Representation of RNA Targets in the Shasta-Trinity RNA Candidates." Unfilled targets will become future inventory needs for RNA representation on the Forests unless they are filled by RNAs established on other Forests.

Forest personnel also projected resource allocations which would take place if the RNA Committee rejected a candidate area and released it for other land management purposes. This "in-lieu-of" analysis is part of the official planning records which are available for on-premise review at the headquarters of the Shasta-Trinity National Forests in Redding, California.

*See the Glossary (Chapter VIII) for an explanation of Forest cover types.

Table F-1
Representation of RNA Targets in the Shasta-Trinity RNA Candidates

Vegetation Type	Physiographic Province	Bald Mountain	Bear Creek	Cascade	Cedar Basin	Devils Rock-Hosselkus	Manzanita Creek	Murphy Glade
SAF 207 Red Fir*	Klamath Mtn.							P
SAF 207 Red fir	Cascade Range			P				
SAF 211 White fir	Klamath Mtn.						S	
SAF 211 White fir	Cascade Range							
SAF 222 Black cottonwood/willow	Klamath/Cascade							
SAF 229 Pacific Douglas-fir	Klamath Mtn.						S	
SAF 230 Douglas-fir/w. hemlock	Klamath Mtn.							
SAF 231 Port-Orford-cedar	Klamath Mtn.				P			
SAF 234 Douglas-fir/tanoak/Pacific madrone	Klamath Mtn.							
SAF 237 Interior ponderosa pine	Modoc Plateau							
SAF 243 Sierra Nevada mixed conifer	Klamath Mtn.				S	S	S	
SAF 243 Sierra Nevada mixed conifer	Cascade Range							
SAF 244 Pacific ponderosa pine/ Douglas-fir	Klamath Mtn.					S	P	
SAF 244 Pacific ponderosa pine/ Douglas-fir	Cascade Range							
SAF 246 California black oak	Klamath Mtn.					P/S		
SAF 246 California black oak	Cascade Range							
SAF 247 Jeffrey pine	Klamath Mtn.							
SAF 247 Jeffrey pine	Modoc Plateau							
SAF 248 Knobcone pine	Klamath Mtn.							
SAF 248 Knobcone pine	Cascade Range							
SAF 256 California mixed subalpine	Cascade Range							
K-24 Western juniper**	Modoc Plateau							
K-30 Foothill woodland	Cascade Range							
K-34 Montane chaparral	Klamath Mtn.							
Darlingtonia bog	Klamath Mtn.				S			
Moss bog	Klamath Mtn.							
Alpine Fellfields	Klamath Mtn.							
Brewer spruce	Klamath Mtn.							
Enriched conifer	Klamath Mtn.							
Foxtail pine	Klamath Mtn.							
MacNab cypress***	Cascade Range							
Baker cypress***	Klamath Mtn./Cascade Range/Modoc Plateau							
Other Unique Elements	All	U	U		U	U		

P = Primary RNA Targets
S = Secondary RNA Targets
U = Undetermined at this time

* Society of American Foresters Cover Type Classification.
** Kuchler's Vegetative Types.
*** Targets are not applicable to Shasta-Trinity National Forest lands.

Table F-1
(Continued)

Vegetation Type	Physiographic Province	Mt. Eddy	Preacher Meadows	Red Butte-Red Fir Ridge	Rough Gulch	Smoky Creek	South Fork Mtn.	Stuart Fork
SAF 207 Red Fir*	Klamath Mtn.							
SAF 207 Red fir	Cascade Range			P				
SAF 211 White fir	Klamath Mtn.							
SAF 211 White fir	Cascade Range							
SAF 222 Black cottonwood/willow	Klamath/Cascade							
SAF 229 Pacific Douglas-fir	Klamath Mtn.				P		P	
SAF 230 Douglas-fir/w. hemlock	Klamath Mtn.							
SAF 231 Port-Orford-cedar	Klamath Mtn.							
SAF 234 Douglas-fir/tanoak/Pacific madrone	Klamath Mtn.							
SAF 237 Interior ponderosa pine	Modoc Plateau							
SAF 243 Sierra Nevada mixed conifer	Klamath Mtn.		P					
SAF 243 Sierra Nevada mixed conifer	Cascade Range							
SAF 244 Pacific ponderosa pine/ Douglas-fir	Klamath Mtn.				S	P		
SAF 244 Pacific ponderosa pine/ Douglas-fir	Cascade Range							
SAF 246 California black oak	Klamath Mtn.							
SAF 246 California black oak	Cascade Range							
SAF 247 Jeffrey pine	Klamath Mtn.					S		
SAF 247 Jeffrey pine	Modoc Plateau							
SAF 248 Knobcone pine	Klamath Mtn.							
SAF 248 Knobcone pine	Cascade Range							
SAF 256 California mixed subalpine	Cascade Range			S				
K-24 Western juniper**	Modoc Plateau							
K-30 Foothill woodland	Cascade Range							
K-34 Montane chaparral	Klamath Mtn.							P
Darlingtonia bog	Klamath Mtn.		S					
Moss bog	Klamath Mtn.							
Alpine Fellfields	Klamath Mtn.							
Brewer spruce	Klamath Mtn.							
Enriched conifer	Klamath Mtn.							
Foxtail pine	Klamath Mtn.	P						
MacNab cypress***	Cascade Range							
Baker cypress***	Klamath Mtn./Cascade Range/Modoc Plateau							
Other Unique Elements	All		U		U			

P = Primary RNA Targets
S = Secondary RNA Targets
U = Undetermined at This Time

* Society of American Foresters Cover Type Classification.
** Kuchler's Vegetative Types.
*** Targets are not applicable to Shasta-Trinity National Forest lands.

Table F-2
Research Natural Area Candidates - Present Use Situation

RNA Candidate	Bald Mtn. Creek	Bear Creek	Cascade	Cedar Basin	Devils Rock-Hosselkus	Manzanita Creek	Murphy Glade
Timber Strata (Acres)							
00 Not Suitable	-	2,700	208	500	2,740	7,250	40
05 HX	-	-	-	-	1,150	-	-
09 M2G	-	130	-	-	-	-	-
11 M3G	-	1,170	240	-	510	-	850
12 M3P	-	500	40	660	580	-	92
18 R3G	-	-	862	-	-	-	210
19 R3P	-	-	650	-	-	-	68
Estimated Potential Biological Yield (Thousand Board Feet [mbf] /Year)							
05 HX	-	-	-	-	5	-	-
09 M2G	-	52	-	-	-	-	-
11 M3G	-	498	95	-	95	-	350
12 M3P	-	240	15	260	20	-	36
18 R3G	-	-	340	-	-	-	66
19 R3P	-	-	260	-	-	-	28
Recreation (Recreation Visitor Days [RVDs])							
Dispersed Camping	-	-	270	300	-	-	10
Off-Highway Vehicle (OHV)	-	-	-	-	-	-	-
Hunting	-	6	100	400	70	-	15
Fishing	-	60	-	60	-	-	-
Snowmobile	-	-	-	45	-	-	-
Threatened, Endangered and Sensitive (T,E&S) Animals (acres)							
00 Low Suitablilty	-	4,500	2,000	1,160	0	7,250	1,140
03 High Suitability	-	0	0	0	4,980	0	120
T,E &S Plants (Acres)							
00 No Known Occurrences	800	4,500	2,000	1,160	5,550	7,250	1,260
03 Known Occurrences	0	0	0	0	0	0	0
Potential T,E&S Animals (Acres)							
00 Low Suitability	-	2,940	2,000	1,160	0	7,250	1,140
03 High Suitability	-	1,560	0	0	4,980	0	120
Potential T,E&S Plants (Acres)							
00 Low Suitability	600	4,450	1,960	1,100	0	6,250	1,220
03 High Suitability	200	<50	<40	<60	5,550	<1,000	<40
Wildlife Harvest Species (Acres)							
00 Not Suitable	-	720	60	100	1,340	2,240	-
01 Low	-	600	1,460	250	0	470	1,190
02 Moderate	-	1,680	480	700	190	590	70
03 High	-	1,500	0	110	3,450	3,950	-
Minerals (Acres)							
00 Not Suitable	-	0	2,000	1,160	0	56	1,260
03 Suitable	-	4,500	0	0	4,980	7,194	0

Table F-2 (Continued)

RNA Candidate	Mt. Eddy	Preacher Meadows	Red Butte-Red Fir Ridge	Rough Gulch	Smoky Creek	South Fork Mtn.	Stuart Fork
Timber Strata (Acres)							
00 Not Suitable	890	1,850	1,640	1,110	-	119	1,500
05 HX	-	-	-	-	-	-	-
09 M2G	-	-	-	300	-	119	-
11 M3G	-	-	-	2,130	523	823	-
12 M3P	-	-	-	420	477	119	-
18 R3G	-	-	-	-	-	-	-
19 R3P	-	-	-	-	-	-	-
Estimated Potential Biological Yield (Thousand Board Feet [mbf] /Year)							
05 HX	-	-	-	-	-	-	-
09 M2G	-	-	-	-	-	-	-
11 M3G	-	-	-	854	190	138	-
12 M3P	-	-	-	165	166	11	-
18 R3G	-	-	-	-	-	-	-
19 R3P	-	-	-	-	-	-	-
Recreation (Recreation Visitor Days [RVDs])							
Dispersed Camping	-	655	-	-	-	-	-
Off-Highway Vehicle (OHV)	-	438	-	-	-	-	-
Hunting	-	-	62	-	-	10	-
Fishing	-	6	-	-	-	-	-
Snowmobile	-	-	-	-	-	-	-
Threatened, Endangered and Sensitive (T,E&S) Animals (acres)							
00 Low Suitablilty	890	1,850	1,640	3,960	1,000	1,180	1,500
03 High Suitability	0	0	0	0	0	0	-
T,E &S Plants (Acres)							
00 No Known Occurrences	730	1,850	1,600	3,920	950	1,180	1,500
03 Known Occurrences	160	0	40	40	0	0	0
Potential T,E&S Animals (Acres)							
00 Low Suitability	890	1,850	1,235	3,860	1,000	1,124	1,500
03 High Suitability	0	0	405	100	0	56	0
Potential T,E&S Plants (Acres)							
00 Low Suitability	0	1,800	1,480	2,920	850	1,100	1,400
03 High Suitability	890	50	120	<1,000	100	80	100
Wildlife Harvest Species (Acres)							
00 Not Suitable	350	1,350	84	0	0	0	480
01 Low	540	220	1,276	210	0	174	540
02 Moderate	0	280	280	3,080	110	710	480
03 High	0	0	0	670	890	296	-
Minerals (Acres)							
00 Not Suitable	310	335	1,640	820	0	0	0
03 Suitable	580	1,515	0	3,140	1,000	1,180	1,500

Bald Mountain Creek

Description: The 800 acre Bald Mountain Creek area only recently has been proposed (Spring of 1993) by the Citizens for Better Forestry. This RNA would serve as a completely undisturbed benchmark watershed representative of other adjacent watersheds under timber management and would be monitored as a control watershed.

Map boundaries have not been defined as of this printing.

Figure F-1
(reserved for Bald Mountain Creek map)

Bear Creek

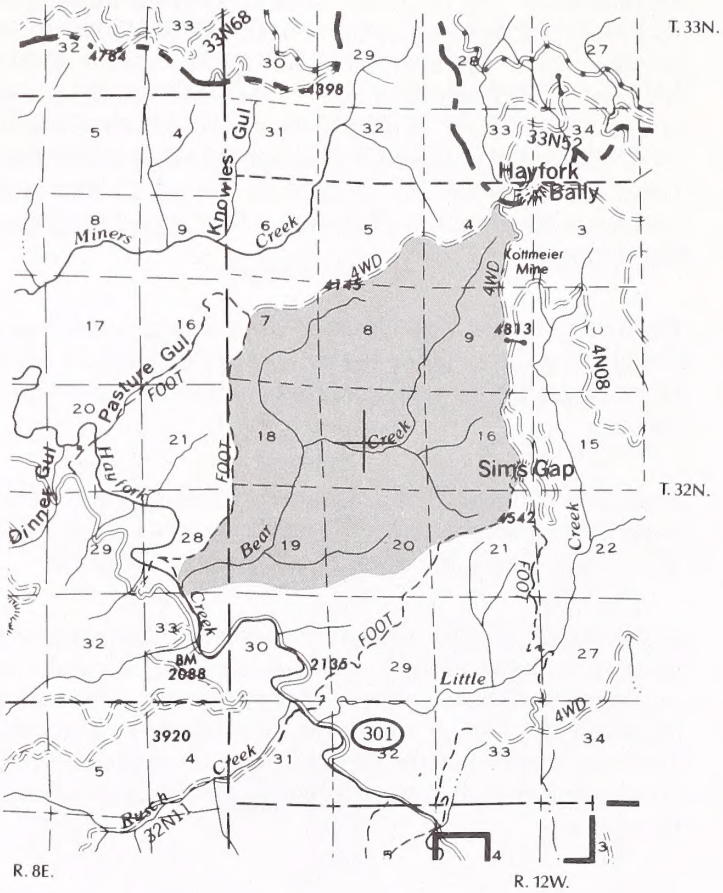
Description: The proposed Bear Creek Research Natural Area (RNA) is located on the Hayfork Ranger District approximately 6 air miles northwest of Hayfork. The area totals about 4,500 acres, including nearly 640 acres of private land. Bear Creek is a tributary to Hayfork Creek, which in turn is a tributary to the South Fork Trinity River. Elevations range from 650 to 1,900 feet. The Forest cover type is mixed conifer. Soils in much of the area are developed from granitic geologic material which is often highly erodible.

Planning Status: This area was proposed by the Citizens For Better Forestry in 1987. There has been no field reconnaissance or ecologial survey.

Research Values: The Bear Creek area was proposed as a RNA to serve as a monitoring benchmark watershed to determine the effects of land management activities on highly erodible granitic soils. The Bear Creek watershed would be monitored as a control watershed.

Resource Conflicts: Approximately 42 percent of the area contains potentially suitable timber land which could be managed for intensive timber management. The average annual sustained yield would be about 790 thousand board feet (mbf). The section of private land within the area, if managed for timber harvest or other land disturbing objectives, would conflict with the intended purpose of the RNA (watershed monitoring). There are no locatable mineral values within the proposed area. Prospecting for and possible removal of locatable minerals would be in conflict with the purpose of a RNA. The area is not used for livestock grazing.

Figure F-2



BEAR CREEK

Cascade

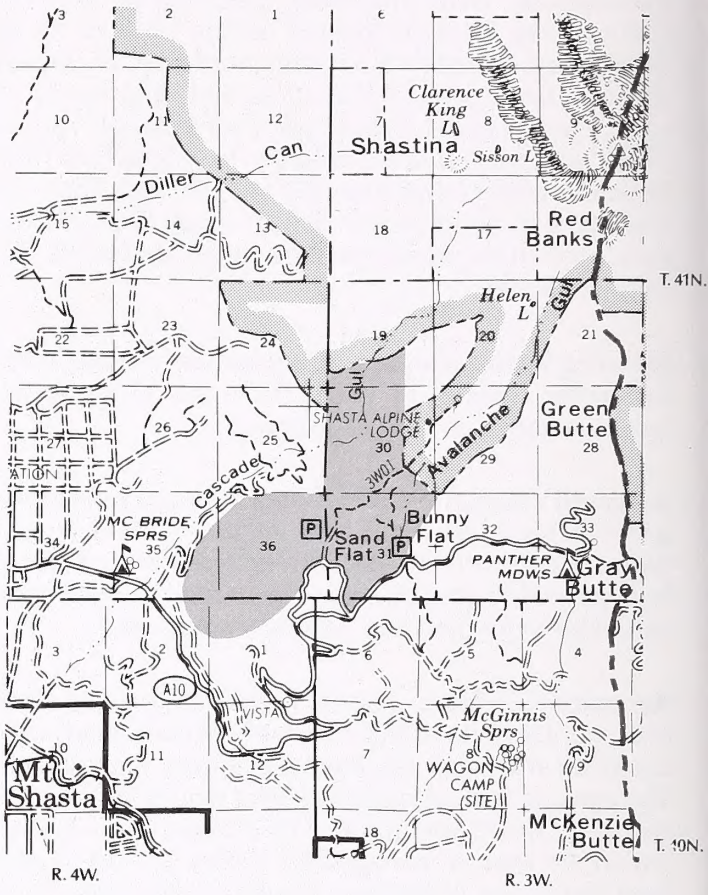
Description: The proposed Cascade RNA is located on the Mt. Shasta Ranger District about 3 air miles northeast of Mt. Shasta City and adjacent to, but outside of, the Mt. Shasta Wilderness Area. This area encompasses about 2,000 acres, all of which are on National Forest land. Elevations range from about 5,200 to 8,000 feet. Forest cover types are classed as mixed conifer with considerable amounts of Shasta red fir (Abies magnifica shastensis).

Planning Status: The Cascade area was proposed as a RNA by the Citizens For Better Forestry in 1987. No field reconnaissance or ecological evaluation has been conducted.

Research Values: The Cascade area was proposed to meet the requirements for the red fir vegetation type (SAF 207) in the Cascade Range Physiographic Province.

Resource Conflicts: About 90 percent of the area contains tentatively suitable timber land which could be managed for intensive timber management. This would represent an annual sustained yield of about 710 mbf. The area receives some dispersed recreational use which could conflict with RNA objectives. No livestock grazing takes place.

Figure F-3



CASCADE

Cedar Basin

Description: The proposed Cedar Basin RNA is located on the Mt. Shasta Ranger District approximately 10 air miles southwest of Mt. Shasta City. The area totals about 1,160 acres and lies near the upper headwaters of the South Fork of the Sacramento River. Elevations range from 5,400 to 7,100 feet. The proposed area contains Cedar Lake, Cliff Lake, Lower Cliff Lake, Upper Cliff Lake, Terrace Lake, and two unnamed ponds. Forest cover types are generally classed as mixed conifer with a Port-Orford-cedar Cupressus lawsoniana (=Chamaecyparis lawsoniana) component. Much of the area consists of a myriad of plant communities and vegetative types.

Planning Status: The proposed area was initially screened by a field reconnaissance during the summer of 1980 and subsequently nominated in October 1980. An ecological survey was completed in the summer of 1982.

Research Values: This area best fulfills the Port-Orford-cedar vegetation type (SAF 231) target within the Klamath Mountains Physiographic Province. Other botanic elements represented within this area include the Sierra Nevada mixed conifer (SAF 243) and the Darlingtonia bog vegetation types. The basin contains excellent examples of inland Port-Orford-cedar in both pure and mixed stands from 5,400 to 6,400 feet.

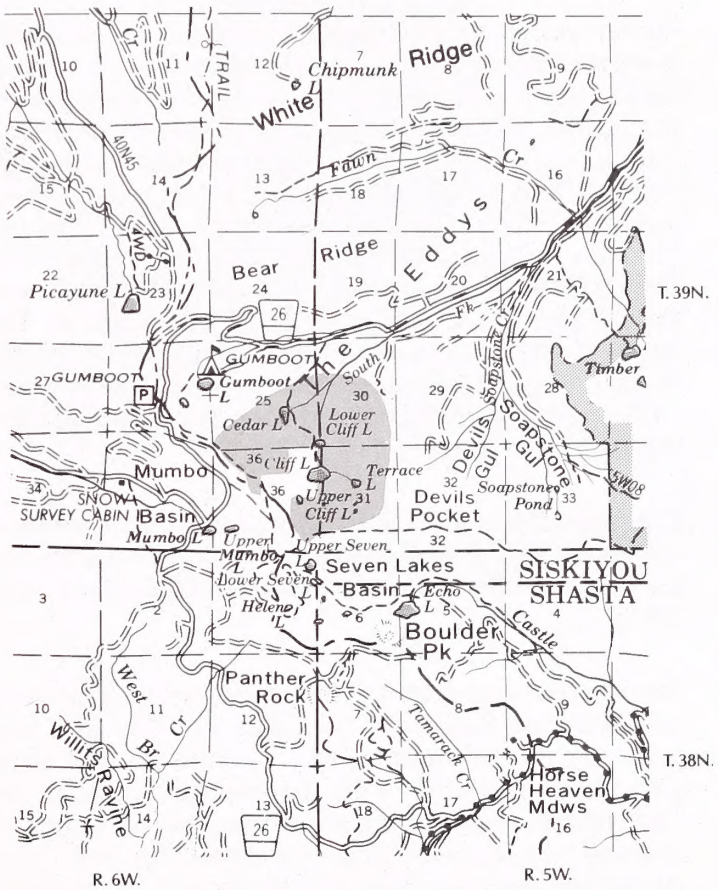
At least two beneficial research objectives could be met: (1) because of infestation of many of the coastal Port-Orford cedar stands by Phytophthora lateralis and the possibility of further spread in the coastal areas, these stands provide opportunities to protect areas from exposure to the fungus; and (2) these stands are representative of inland Port-Orford cedar that are ecologically and genetically distinct from coastal populations. Protecting this distinct area will provide for the conservation of a wider genetic resource.

The area includes a large number of plant communities and 11 different species of conifers. It also contains the type locality for the sensitive plant species Klamath manzanita (Arctostaphylos klamathensis).

The most significant conflict of the proposed research activities in this area with other land users is with dispersed motorized recreationists and fishermen using the low-grade Cedar Basin road (#39N05Y). This road has also provided a means of access for woodcutting, both permitted and illegal. Keeping this road open provides an avenue for introduction of Phytophthora lateralis and the associated threat to Port-Orford cedar in this RNA. Of lesser impact are recreationists using the Pacific Crest Trail (PCT), which essentially forms the proposed southern boundary of the area. The area is within the South Highland grazing allotment.

Resource Conflicts: Nearly 57 percent of the area contains tentatively suitable timber land which could be managed for intensive timber management. About 260 mbf of potential sustained annual yield would be foregone under RNA designation. The private lands adjacent to the proposed RNA boundary pose a potential conflict. However, the current landowners do not intend to initiate any ground-disturbing developments on their land.

Figure F-4



CEDAR BASIN

Devils Rock-Hosselkus

Description: The proposed Devils Rock-Hosselkus RNA is located on the Shasta Lake Ranger District about 24 air miles northeast of Redding. The boundaries of the proposed area include some 5,550 acres. The area can be accessed for research studies by a barely passable jeep road and trail near Chirpchatter Campground. The proposed Devils Rock RNA lies immediately to the east and contiguous to the Hosselkus area. A small portion of the south end of the area also lies within the Shasta Unit of the Whiskeytown-Shasta-Trinity National Recreation Area (NRA).

The proposed area straddles a prominent north-south trending limestone ridge dominated by Brock Mountain on the south and Devils Rock and Brock Butte on the north. This ridge forms the main divide between the Squaw Creek and Pit River watersheds. Elevations range from 1,280 to 3,450 feet just south of Devils Rock. Major perennial streams include Low Pass Creek Canyon, Madison Canyon, Dinner Gulch, and Bars Creek in the Squaw Creek watershed and Susanville Canyon, Brock Creek, and Flat Creek in the Pit River drainage. The vegetative type is generally classed as oak woodland, but there are also other minor cover types within the area including low elevation mixed conifer, canyon riparian, and limestone scrub.

Planning Status: The Devils Rock portion of the area was initially screened by a field reconnaissance during the summer of 1984. No action has been taken since April 1985.

The Hosselkus portion was initially visited by a group of University of California scientists in 1966 and was proposed to the Regional RNA Committee that same year. In December, 1974 the area was nominated by the Committee and recommendations were made to proceed with an ecological evaluation. The ecological evaluation was completed by Virginia and Todd Keeler-Wolf during the summer of 1975.

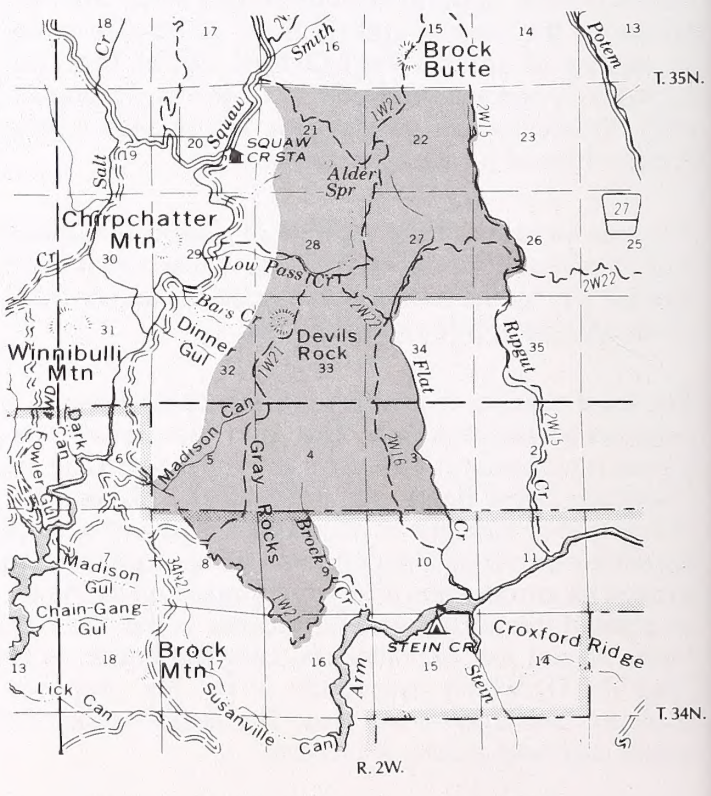
Research Values: The Devils Rock portion of the RNA ideally fulfills the California black oak vegetation type (SAF 246) target within the Klamath Mountains Physiographic Province. The oak stands are dense and result in little diversity of woody shrubs and herbaceous vegetation. Most of the California black oak (Quercus kelloggii) trees in this area are 40 to 80 years old, although much older monarchs are present. The complex geology in this area adds to its value as a target vegetation type.

The Hosselkus portion does not specifically meet a designated terrestrial vegetation target. The area was originally proposed primarily for its unique paleontological features which are found in rich abundance in the limestone formations in the heart of the area, and the unique biotic communities which are associated with these habitats. However, in 1992 a new species of shrub in the rose family was discovered growing off of Highway 299 on Hosselkus limestone. The new plant, Shasta snow-wreath (Neviusia cliftonii), has since been located in two other locations, near or on the border of this RNA. This species, whose closest relative occurs in the southeastern part of the United States, is thought to be a relict from the Arcto-Tertiary geologic period. It is likely that this area will provide many research opportunities. Other endemic species known to occur here are the Shasta eupatory, Eupatorium shastense, in the sunflower family, and the Shasta salamander (Hydromantes shastae). This amphibian is a Federal Category 2 candidate and a State-listed threatened species. Current scientific thinking indicates that this area may yield other new and previously undescribed plants or animals.

The area also satisfies the secondary vegetation targets for California black oak (SAF 246), Sierra Nevada mixed conifer (SAF 243), and Pacific ponderosa pine/Douglas-fir (SAF 244) types within the Klamath Mountains Physiographic Province. The area has been a focal point for paleontologists since 1895.

Resource Conflicts: Approximately 47 percent of the area contains tentatively suitable timber land which could be managed intensively for timber without adverse impacts on the environment. Potential yields are about 120 mbf per year. However, about one-third of the suitable timber lands consist of hardwood stands. The conifer stands in the area are in small patches and would be costly to harvest and regenerate. Few impacts on dispersed recreation use (mostly hunting) are anticipated by the proposed RNA designation. The area is not used for livestock grazing.

Figure F-5



Manzanita Creek

Description: The proposed Manzanita Creek RNA is located on the Big Bar Ranger District about 17 air miles west of Weaverville. The area under consideration totals 7,250 acres, all of which are in National Forest ownership. Elevations range from 1,200 to 5,932 feet. The area is bounded on the west by Treloar Ridge and on the east by Manzanita Ridge; it extends from within one mile of the mouth of Manzanita Creek to the head of this stream near Twin Sisters Mountain. Only a small portion of the area is broadly classed as mixed conifer. A large part of the balance of the area consists of shrub and chaparral types, with subalpine chaparral types growing at the higher elevations. The area is within the boundaries of the Trinity Alps Wilderness.

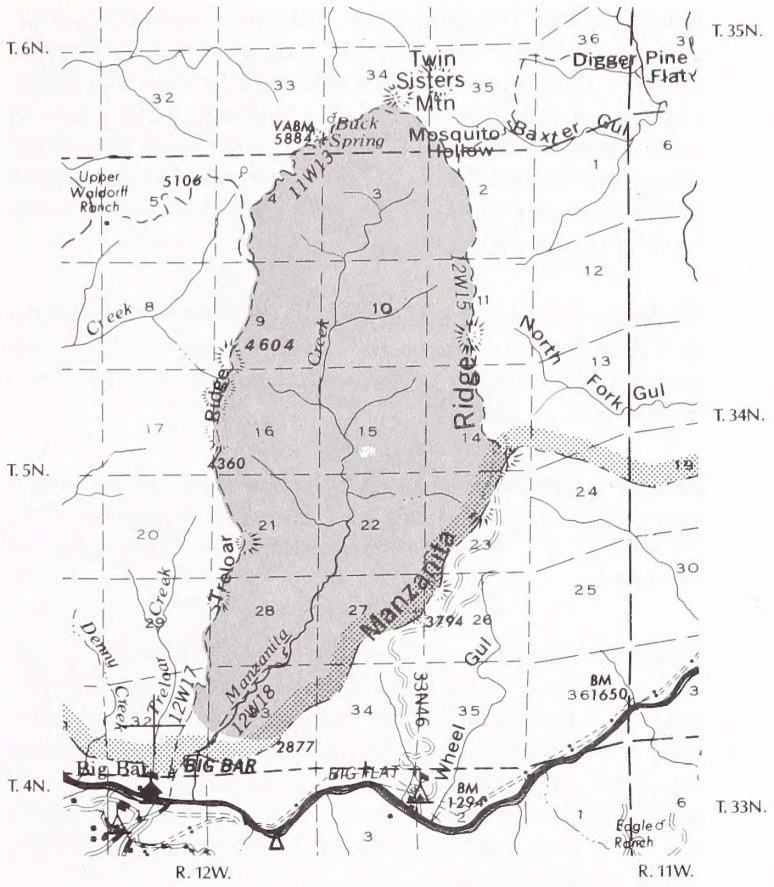
Planning Status: The area was originally proposed for RNA consideration in 1973. An initial field reconnaissance was conducted in October, 1978. The area was subsequently nominated and recommended for ecological survey in early 1979. Taylor and Tease completed the ecological survey in October 1979. The survey was accepted, and in September, 1980, the Regional RNA Committee recommended the area for RNA classification.

Research Values: The area meets the RNA targets for Pacific ponderosa pine/Douglas-fir (SAF 244) vegetation type for the Klamath Mountains Physiographic Province. The SAF 244 type is also represented by the proposed Smoky Creek area on the Hayfork District. Other target elements represented include white fir (SAF 211), Pacific Douglas-fir (SAF 229), and Sierra Nevada mixed conifer (SAF 243) vegetation types. However, past fires in the area have created a high diversity of subclimax plant communities.

The proposed RNA boundary encompasses an entire watershed, 3,950 acres of which were disturbed by the Treloar Fire of July, 1985. The watershed has a gauging station which would be available for controlled watershed studies.

Resource Conflicts: Recent Congressional designation of the area, as part of the Trinity Alps Wilderness, has eliminated off-highway vehicle (OHV) recreation use along Manzanita Ridge up to as far as the foot of Twin Sisters Mountain. Prescribed burning would no longer be possible except under very special circumstances. There would be some conflicts with Wilderness users, as recreation is not encouraged under a RNA classification. However, the heaviest recreation use would probably remain confined to the outside edges of the area along Treloar and Manzanita Ridges. The area is within the Big Bar grazing allotment. Although livestock grazing use is light, there could be some conflict between grazing and the objectives of the RNA.

Figure F-6



MANZANITA CREEK

Murphy Glade

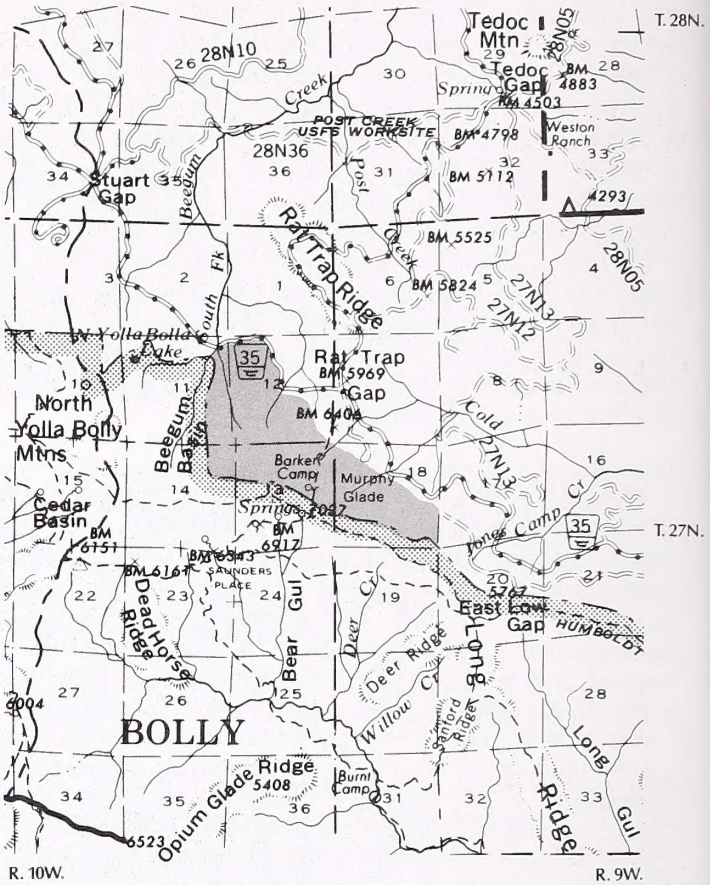
Description: The proposed Murphy Glade RNA is located on the Yolla Bolla Ranger District about 12 air miles south of Platina. This area is adjacent to the Yolla Bolly-Middle Eel Wilderness Area and is about 1,260 acres in size. The entire area is on National Forest land. Elevations range from about 5,600 to 7,200 feet. Forest cover types are classed as mixed conifer with considerable amounts of red fir (Abies magnifica).

Planning Status: The Murphy Glade area was proposed as a RNA by the Citizens For Better Forestry in 1987. No field reconnaissance or ecological evaluation has been conducted.

Research Values: The Murphy Glade area was proposed to meet the requirements for the red fir vegetation type (SAF 207) in the Klamath Mountains Physiographic Province.

Resource Conflicts: Essentially all of the Murphy Glade area contains tentatively suitable timber land which could be managed for intensive timber management. This would represent an annual sustained yield of about 480 mbf. The area receives some dispersed recreational use, but this should not be a conflict. This area is within the Cold Fork grazing allotment, and livestock grazing could cause a conflict.

Figure F-7



MURPHY GLADE

Mt. Eddy

Description: The proposed Mt. Eddy RNA is located on the Mt. Shasta Ranger District about nine air miles west of Mt. Shasta City. The area totals 890 acres, all of which are on National Forest land. The entire area is within the Mt. Eddy Roadless Area which was placed in a "further planning" category. Mt. Eddy is being analyzed for both Wilderness and non-wilderness options within this Draft EIS (refer to Appendix C). Topographically the area includes a ridge extending south from Mt. Eddy, another ridge extending southwest, and a lower ridge to the south of the Deadfall Lakes and the Deadfall Lakes Basin. Elevations range from 7,000 feet in the Deadfall Lakes Basin to 9,025 feet at the summit of Mt. Eddy.

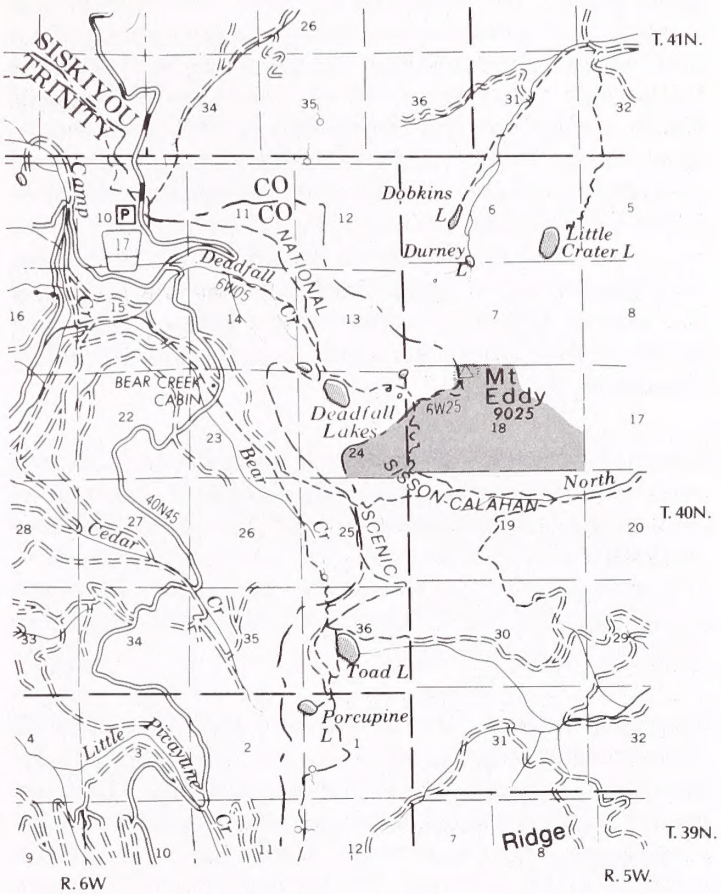
The major feature of this area is Mt. Eddy. The vegetation is composed primarily of high elevation open pine forests with sparse rocky slope herbs and a noticeable lack of shrub understory. The most extensive vegetation is a western white pine (Pinus monticola) dominated forest. Above the western white pine forest is a nearly pure foxtail pine (P. balfouriana) forest.

Planning Status: The area was initially screened through field reconnaissance in 1976. An ecological survey was completed in July, 1978, with acceptance by the Regional RNA Committee in June, 1980. It was recommended that a RNA be established. Because of the RARE II decision to place the Mt. Eddy Roadless Area in a "further planning" status, no further action on the RNA proposal has been taken.

Research Values: The proposed area fulfills the target requirements for foxtail pine for the Klamath Mountains Physiographic Province. The Mt. Eddy foxtail pine population covers 240 acres within the proposed RNA. The foxtail pine population is large and healthy and provides an excellent example of this target. The need for this target is high. No other RNA proposals within this physiographic province contain significant populations of foxtail pine. The entire area is botanically exceptional, with a number of sensitive plant occurrences, including the State listed threatened species Trinity buckwheat (Eriogonum alpinum).

Resource Conflicts: There is a trail running through the proposed area, with some insignificant dispersed recreation use taking place. There are no tentatively suitable timber lands within the area. Livestock grazing is sporadic.

Figure F-8



MT. EDDY

Preacher Meadows

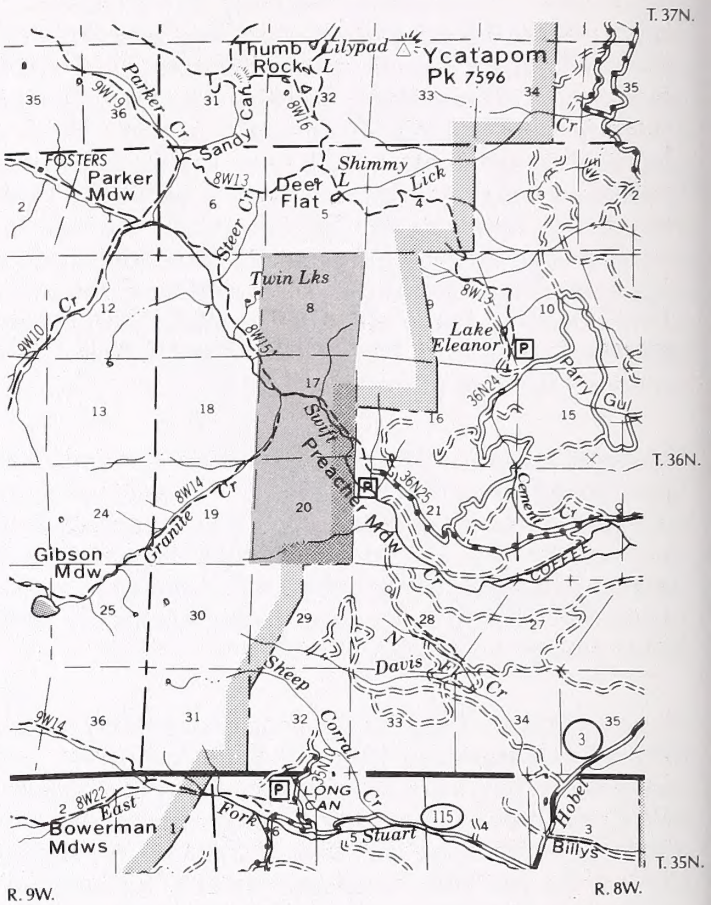
Description: The proposed Preacher Meadows RNA is located on the Weaverville Ranger District about 16 air miles north of Weaverville. The boundaries of the area encompass 1,850 acres, all of which are in National Forest ownership. The entire area is within the boundaries of the Trinity Alps Wilderness. Access is by road up to the eastern edge of the area. Elevations range from 3,800 (along Swift Creek) to 6,100 feet. Forest cover types are broadly classed as mixed conifer, but other non-forested types occur, such as montane chaparral and various bog plant communities. Major features include Swift Creek, Granite Creek, and Preacher Meadows.

Planning Status: It is unknown exactly when the area was reconnaissanced. The Regional RNA Committee recommended candidacy for this area and further recommended that an ecological survey be conducted. The ecological survey was completed in July 1978 and accepted by the RNA Committee in July 1980. No further planning has been done.

Research Values: The area meets the Sierra Nevada mixed conifer forest cover type (SAF 243) target for the Klamath Mountains Physiographic Province. The need for this target is moderate to high. Undisturbed samples of adequate size in commercial timber stands are difficult to locate in this province. The Darlingtonia bog containing California pitcher plant (Darlingtonia californica), as well as the rare orchid California lady's slipper (Cypripedium californicum), a Siskiyou Mountains serpentine endemic, add to the value of this area.

Resource Conflicts: The most signficant impact of a RNA classification would be on recreationists entering the Trinity Alps Wilderness from the trailhead at the end of the Swift Creek Road. An estimated 1,200 recreation visitor days (RVDs) of use occur in this area annually. Research activities would need to avoid the trail along Swift and Granite Creeks. There is no livestock grazing use.

Figure F-9



PREACHER MEADOWS

Red Butte-Red Fir Ridge

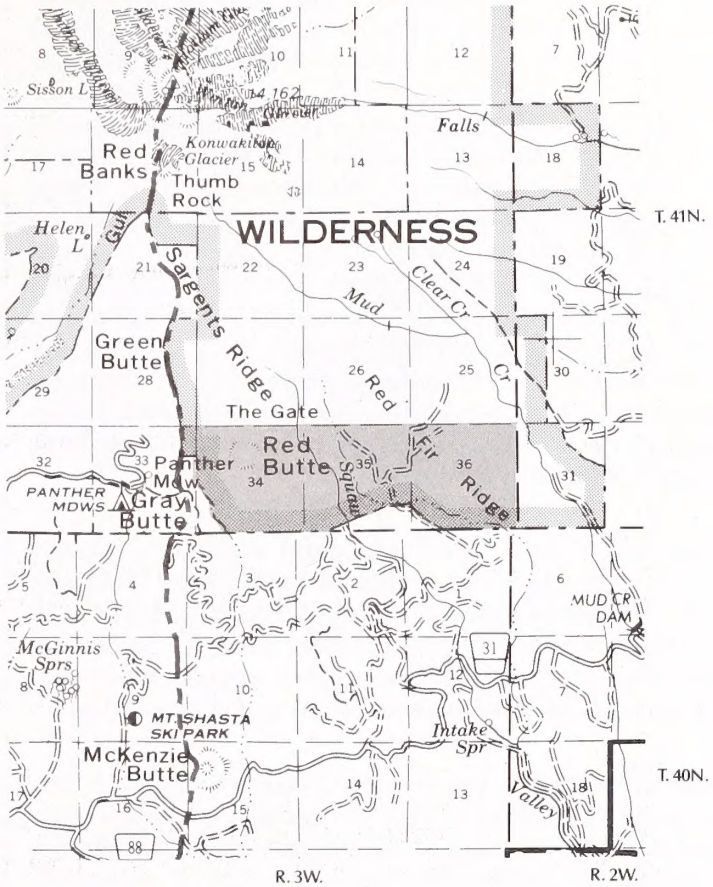
Description: The proposed Red Butte-Red Fir Ridge RNA is located on the McCloud Ranger District on the south slopes of Mt. Shasta. It is about 7 miles northeast of Mt. Shasta City and 7 miles northwest of McCloud. The area totals 1,640 acres, all of which are on National Forest lands. The total area is within the expanded boundaries of the Mt. Shasta Wilderness, as designated by Congress in 1984. Topographically, Red Butte (elevation 8,950 feet) dominates the area, rising more than 400 feet above the surrounding terrain. Elevations range from 7,200 to 8,950 feet. The cover type is generally classed as red fir forest. However, there is some alpine and California mixed subalpine cover type.

Planning Status: The area was originally nominated in July 1973. A field reconnaissance was conducted in July 1981. Due to an obvious scarcity of red fir targets, the area was recommended by the Regional RNA Committee in early 1983 for inclusion in at least one of the alternatives of this Draft EIS and for subsequent RNA establishment. An ecological survey is under contract and is due for completion in September, 1988.

Research Values: The area meets the RNA requirements for the red fir vegetation type (SAF 207) in the Cascade Range Physiographic Province. It represents the undisturbed conditions occurring at the higher elevations of the red fir range. A secondary element of the California mixed subalpine forest (SAF 256) is also found within the area. Several populations of the sensitive plant species Wilkin's harebell (Campanula wilkinsiana) also occur near or at the borders of this proposed RNA along Swift and Granite Creeks.

Resource Conflicts: Because of the 1984 designation of the Mt. Shasta Wilderness, resource conflicts will be limited to possible impacts on wilderness and primitive recreation opportunities. Recreation use within the area is sporadic. Some dispersed camping occurs at Squaw Valley Creek Meadows, but this is outside the proposed boundaries of the area. There is no livestock grazing use.

Figure F-10



RED BUTTE • RED FIR RIDGE

Rough Gulch

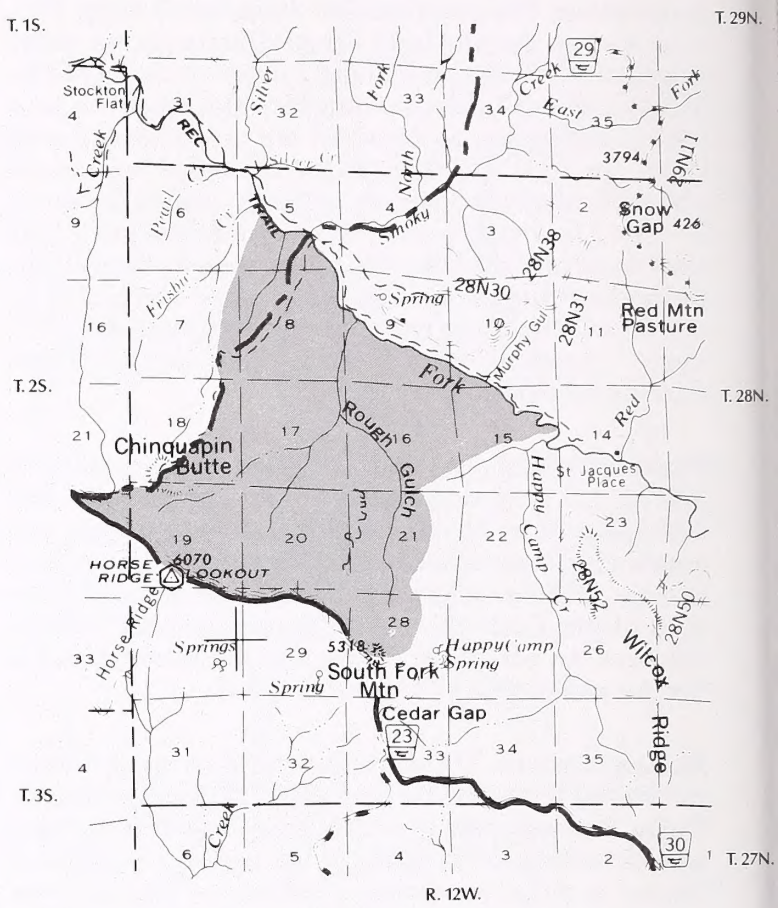
Description: The proposed Rough Gulch RNA is located on the Yolla Bolla Ranger District about 19 air miles south of Hayfork. The area under consideration totals 3,960 acres, all of which are on National Forest land. Elevations range from 2,540 to 6,070 feet. The proposed area includes an area which is being proposed for establishment as a RNA - South Fork Mountain. The Rough Gulch area includes a broad-topped, moderately sloping ridge known locally as Chinquapin Ridge; it also includes the steep-sloping lands within Rough Gulch and portions along the South Fork Trinity River. The Rough Gulch inner gorge and portions along the South Fork Trinity River are very steep (60-80 percent slopes); they contain significant areas of mass instability. Forest cover types are generally classed as mixed conifer with Douglas-fir (Pseudotsuga menziesii) and golden chinquapin (Castanopsis chrysophylla) components.

Planning Status: The proposed area was initially screened by a field reconnaissance conducted on May 9, 1981. Further field evaluation was made in the fall of 1984 by Todd Keeler-Wolf. The boundary for this proposal was recommended by Todd Keeler-Wolf to include what he considered the best representation of the target type.

Research Values: The proposed Rough Gulch RNA area contains a Douglas-fir/giant chinquapin/beargrass community which appears to be uniquely different from the communities within the Pacific Douglas-fir vegetation type (SAF 229) represented by the contiguous, proposed South Fork Mountain RNA. Many of the individual chinquapins in the area are in excess of 3 feet diameter at breast height and 100 feet or more tall. The area would meet the target requirements for the Pacific Douglas-fir vegetation type (SAF 229) for the Klamath Mountains Physiographic Province. The area has secondary targets which are representative of the Pacific ponderosa pine/Douglas-fir vegetation type (SAF 244) and the aforementioned beargrass community.

Resource Conflicts: Approximately 60 percent of the area contains tentatively suitable timber land which could be managed for intensive timber management. About 1,000 mbf of potential sustained annual yield would be foregone under a RNA designation. There are no locatable mineral values within the candidate area. Dispersed recreation uses along the South Fork Trinity River are topographically isolated from most of the proposed area and would pose no impacts now or in the future. There are no roads within the area itself. Much of the area is either within extremely unstable landscapes (inner gorges) or within the territory of a known nest site of the northern spotted owl, a threatened species. There is no livestock grazing within this area.

Figure F-11



ROUGH GULCH

Area proposed in Alternatives PRF and CUR (2,200 acres)

Smoky Creek

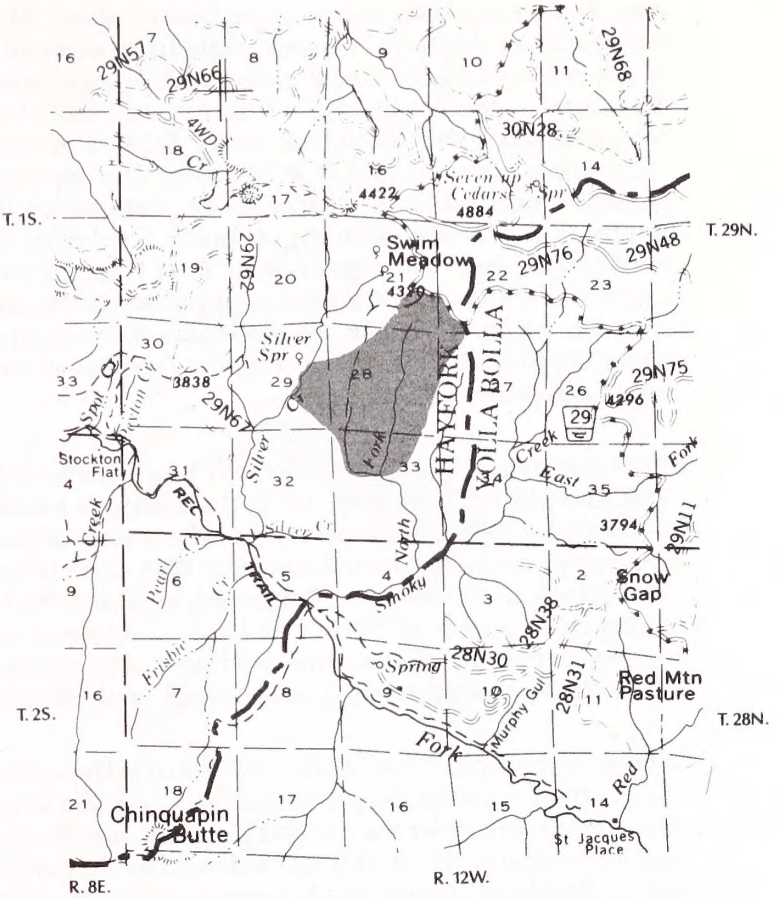
Description: The proposed Smoky Creek RNA is located on the Hayfork Ranger District about 16 air miles south of Hayfork. The area encompasses some 960 acres, all of which are in National Forest ownership. The area lies within the Smoky Creek drainage, a tributary to the South Fork Trinity River. The area is easily accessible by Forest roads and the Smoky Creek trail which crosses the middle of the area. Elevations range from 3,200 to 4,200 feet. The forest cover type is generally classed as mixed conifer.

Planning Status: The area was initially screened through a field reconnaissance conducted in October, 1978. It was recommended for candidacy by the Regional RNA Committee in November, 1978. An ecological survey was completed in October, 1979, and subsequently accepted by the RNA Committee in September, 1980, with a recommendation for RNA establishment.

Research Values: The proposed area meets the RNA target for Pacific ponderosa pine/Douglas-fir (SAF 244) in the Klamath Mountains Physiographic Province. A secondary target, the Jeffrey pine type (SAF 247), is also represented and may well be needed as a primary target for the network. There are indications through the official file and area reports that the low density of the over-mature overstory is a disadvantage in the proposed area. This type is also represented by the proposed Manzanita Creek RNA.

Resource Conflicts: Most of the proposed area contains tentatively suitable timber land which could be managed intensively for timber without adverse impacts on the environment. Potential yields are about 356 mbf per year. The area is used very little other than for sporadic uses in the hunting season. This area is within the Post Creek grazing allotment; livestock grazing is incidental.

Figure F-12



SMOKY CREEK

South Fork Mountain

Description: The proposed South Fork Mountain RNA is located on the Yolla Bolla Ranger District about 20 air miles south of Hayfork. The area totals 1,180 acres all of which are in National Forest ownership. The proposed RNA lies on the lower and midslopes of South Fork Mountain along the South Fork Trinity River. Elevations range from about 3,100 to 4,200 feet. The aspect is generally northeasterly in the lower portions of the Happy Camp Creek drainage. About 1.5 miles of the South Fork Trinity River and nearly all of Happy Camp Creek are included in the area. A large portion of this area contains highly unstable, oversteepened landscapes (inner-gorges). The major forest type is Douglas-fir with minor components of white fir.

Planning Status: The area was initially proposed for RNA evaluation in 1973. In May, 1974, the area was initially screened by a field reconnaissance. The area was subsequently nominated by the Regional RNA Committee. An ecological survey was conducted by Dean Taylor during the summer of 1975. The latter survey was accepted by the RNA Committee, and work was initiated on the RNA establishment Environmental Analysis (EA).

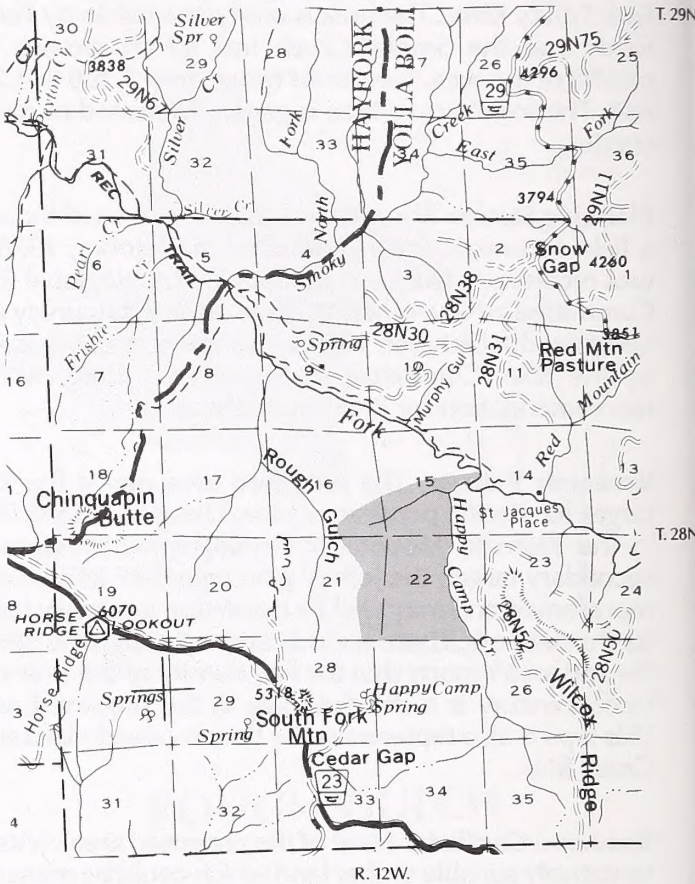
A preliminary draft of this EA was completed in December 1977. The EA was in the process of being revised when planning began under the Second Roadless Area Review and Evaluation (RARE II). This was followed by the California vs. Berglund lawsuit which arose over the decisions in the Final Environmental Impact Statement (Final EIS) for RARE II, issued in 1979. All further work on the RNA establishment EA was suspended until Congress or administrative action, through the National Forest Management Act (NFMA) planning process, resolved the issues in the lawsuit. In 1984, Congress enacted the California Wilderness Act, releasing this area (which was within the Chinquapin Roadless Area) for non-wilderness resource uses.

Research Values: The area meets the Pacific Douglas-fir vegetation (SAF 229) target for the Klamath Mountains Physiographic Province. No sensitive plants are known to grow in this area. This target can also be satisfied in another area proposed for RNA establishment - Rough Gulch.

Resource Conflicts: The boundaries of this area were adjusted to minimize impacts on future use of the adjacent Rough Gulch area. There would be approximately 163 mbf of sustained yield capacity foregone annually if the area was classified as a RNA. Most of this yield originates from over-mature stands of Douglas-fir located on pockets of stable ground. To remove these volumes would involve additional costs for soil and watershed protection.

Intrusions by man along the South Fork Trinity River would be minimal. Recreation use within the area is extremely light. There is no livestock grazing use.

Figure F-13



SOUTH FORK MOUNTAIN

Stuart Fork

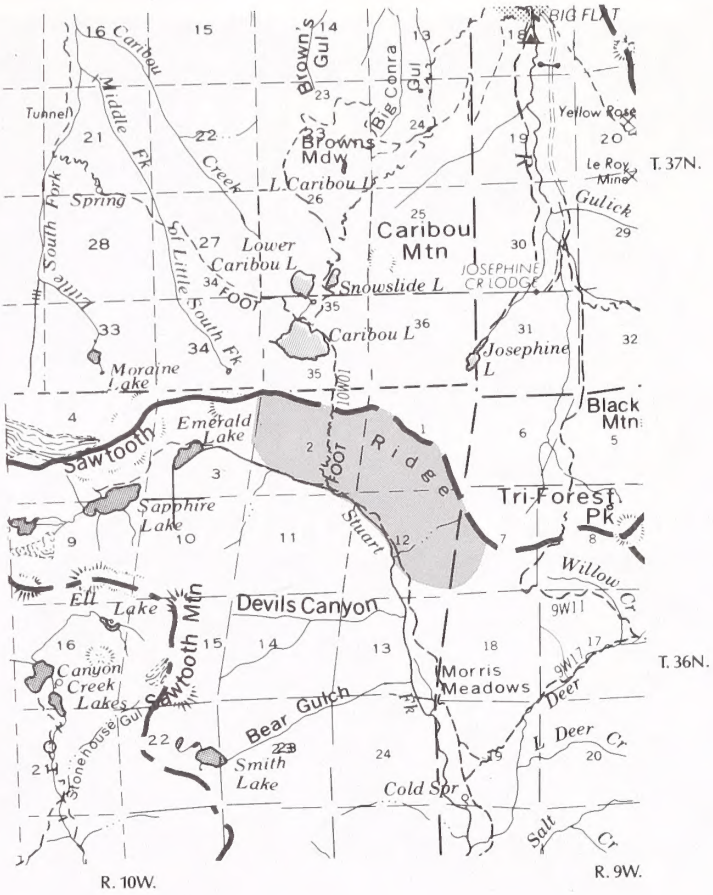
Description: The proposed Stuart Fork RNA is located on the Weaverville Ranger District about 18 miles north of Weaverville. The area totals 1,500 acres, all of which are in National Forest ownership. The area lies within the Trinity Alps Wilderness. Access to the area is difficult, limited to a trail up the Stuart Fork valley. The entire area lies on the southerly and southwesterly-facing slopes below Sawtooth Ridge. Numerous perennial streams and springs originate within the area. Emerald Lake and Stuart Fork are adjacent to the boundaries of the proposed area. Elevations range from 4,500 feet near Morris Meadows to 7,600 feet at the summit of Sawtooth Ridge. The major cover type in the area is subalpine shrub, consisting of montane chaparral.

Planning Status: The area was proposed for RNA consideration in 1984. No field reconnaissance has been done.

Research Values: The area appears to meet the targets for montane chaparral for the Klamath Mountains Physiographic Province. Good examples of this vegetation type are extremely difficult to find in suitable sizes and in an undisturbed state. The major drawback with this area is the difficult access. Conversely, location of the area within the Trinity Alps Wilderness would maintain the undisturbed conditions found here.

Resource Conflicts: Little conflict with primitive recreation uses in the Trinity Alps Wilderness is anticipated. The majority of the montane chaparral type lies almost one-fourth mile away from the Stuart Fork Trail. A steep trail, connecting the Stuart Fork valley with Caribou Lake on the Klamath National Forest, crosses through the area but is seldom used by hikers. There is no livestock grazing in this area.

Figure F-14



STUART FORK

APPENDIX G

Fish, Wildlife, and Botany Habitat Management

APPENDIX G
Fish, Wildlife, and Botany Habitat Management

General Discussion

Four major concepts have been used in the assessment of the effects of the various alternatives described in this Draft Environmental Impact Statement (Draft EIS) upon fish and wildlife populations and habitats: (1) fish and wildlife assemblages as management indicators, (2) viable populations, (3) diversity, and (4) standards and guidelines. The latter is discussed in Chapter II of the Draft EIS, and in the accompanying Forest Plan.

Management indicators, viable populations, and diversity are treated as interrelated concepts. Wildlife and fish populations and habitats are ultimately affected by various levels of management practices applied to an ecosystem, (i.e., the Shasta-Trinity National Forests).

Viable Populations. A viable population for all species is defined as a population capable of maintaining itself over time in the face of anticipated environmental changes, both natural and human-caused. It is not a maximum or a desired population level. Instead, it is the level below which the population is considered to be subject to local elimination due to habitat loss or alteration, disease, disturbance, or some other factor. Threatened or endangered species are considered to be below viable levels.

The development and application of the Forest standards and guidelines is intended to help provide for viability of the Forests' species. The primary mechanism for maintaining viability is through providing a sufficient amount and distribution of habitat types, seral stages, and special habitat components over time.

Application Of The Concepts

It is important to note that management prescriptions and Forest-wide standards and guidelines are written with the intent that they provide for minimum levels of habitat diversity and viable populations of species, regardless of how these prescriptions are assigned by alternative to the land base.

Individual land allocations were made for selected key habitat areas for the following species and/or species groups: bald eagle (endangered), peregrine falcon (endangered), spotted owl (threatened), goshawk (sensitive), black bear, deer, and sensitive plants. For each of these species, geographical areas have been identified for special management for protection and/or enhancement of their habitats. The amount of area allocated varies by alternative.

Land allocations are actually prescriptions for management. Each prescription has a set of standards and guidelines to be applied directly within the prescription or through application of Forest-wide standards and guidelines.

Fish, Wildlife and Botany Programs

Management of the wildlife, fisheries and botany programs on the Forests occurs through two primary efforts: (1) direct management which includes the hands on management, protection or manipulation of a species and/or its habitat, and (2) indirect management, which is the mechanism through which input is provided to proposed projects (i.e., timber sales) which have the potential to affect the species and/or its habitat. Indirect management includes inventory of known populations and their habitats, reconnaissance for potentially affected populations and/or habitats in project areas, mitigation of impacts, and protection of individual species and habitats.

A general overview for existing and future management of the Forests' wildlife, fisheries and botany programs is displayed in **Figure G-3**. This figure indicates that general management direction can be applied to four categories: (1) T&E and sensitive, (2) consumptive, (3) non-consumptive, and (4) special habitats. All of the species habitats can be placed into one or more of these categories and managed accordingly. The remaining figures show the various management groups by specific species and the framework for individual species habitat improvement projects.

The total magnitude of this program, based on five year plan projections, would be at the $4 million level, not including partnerships.

Fish and Wildlife Tables and Figures

The following tables and figures are part of this appendix:

Table G-1 - Fish Species Assemblages

Table G-2 - T&E Species

Table G-3 - Wildlife Species Assemblages

Table G-4 - Sensitive and Endemic Plants

Figure G-1 - Seral Stage Descriptions

Figure G-2 - Diversity Decision Flow Chart

Figure G-3 - Wildlife/Fisheries/Botany Programs

Figure G-4 - Wildlife

Figure G-5 - Wildlife Program

Figure G-6 - Fisheries

Figure G-7 - Fisheries Program

Figure G-8 - Botany

Figure G-9 - Botany Programs

Fish and Wildlife Assemblages as Management Indicators

The basis for the selection of wildlife species was the North Cascades Zone Wildlife Habitat Relationships (WHR) program. The WHR program displays species needs and habitat use by Kuchler vegetation type by seral stage and by special habitat requirements. The relative value of the seral stages for breeding, feeding, and resting by each of the Forests' species is displayed in the WHR program.

Selection of management indicators was based on how well a species met the following: (1) species of primary emphasis on the Forests: harvest species or threatened, endangered or sensitive species; (2) potential for a species within a group to be impacted by the Forests' land management activities; (3) the degree to which a species' biological potential is dependent on the aquatic habitat within National Forest lands; and (4) how well a species represents the habitat requirements for a species management group.

The basic intent of this concept is that by providing suitable habitat for management indicators the habitat needs of all other species would also be provided. To provide for these needs, standards and guidelines were developed for management and protection of special habitat components. Forest management under the National Forest Management Act of 1976 (NFMA) must provide for the monitoring of management indicators. The feasibility of monitoring, including biological factors and logistics, was considered in the management indicator selection process.

Table G-1
Fish Species Assemblages

Management indicators were generally selected based on three criteria: (1) extent of basin-wide or Forest-wide distribution, (2) extent of Forest Service management developments that could potentially benefit or impact the indicator species and (3) the intensity of public interest for the recognition of a group of fish.

The listed fish species, except for the bull trout, occupy habitats that can be impacted by Forest Service management activities.

Two fish species (redband trout and rough sculpin) were not selected as management indicators for their respective assemblages for the following reasons:

Redband Trout. The redband trout was not selected as a management indicator because of low reproductive numbers, limited instream system distribution, and the large contingency of private ownership adjacent to redband trout streams.

Rough Sculpin. Fisheries investigations by BioSystems Analysis, Inc., in 1983 and 1984 in the Pit River system, located rough sculpin in aquatic habitats on private lands and Lassen National Forest administered lands, but not on the Shasta-Trinity National Forests. These investigations indicated the presence of Pit and marbled sculpin, but not the rough sculpin. Therefore, the rough sculpin was not selected as a management indicator.

Several assemblages were combined to form three assemblages discussed here. These are the anadromous fish assemblage, inland coldwater fish assemblage, and the inland warmwater fish assemblage.

Anadromous Fish Assemblage

Anadromous Commercial/Recreational Sportfish
Anadromous Threatened, Endangered and Sensitive Sportfish
Anadromous Nongame Fish

Inland Coldwater Fish Assemblage

Inland Coldwater Sportfish
Inland Threatened, Endangered and Sensitive Sportfish
Inland Coldwater Nongame Fish

Inland Warmwater Fish Assemblage

Inland Warmwater Sportfish
Inland Warmwater Nongame Fish

Anadromous Commercial/Recreational Sportfish

Group Representatives:

Coho
Fall-Run Chinook
Spring-Run Chinook
Winter-Run Steelhead

Group MIS Representative:

Spring-Run Chinook (South Fork Trinity River only)
Winter-Run Steelhead

California Species of Special Concern on the Shasta-Trinity National Forests:

Coho (Oncorhynchus kisutch) [C3]
Fall-Run Chinook (Oncorhynchus tshawytscha) [C5]
Spring-Run Chinook (Oncorhynchus tshawytscha) [C2]
Winter-Run Steelhead (Oncorhynchus mykiss gairdneri) [C5]

Anadromous Threatened, Endangered & Sensitive Sportfish

Group Representative:

Spring-Run [Summer] Steelhead

Group MIS Representative:

Spring-Run [Summer] Steelhead (South Fork Trinity River only)

California Species of Special Concern on the Shasta-Trinity National Forests:

Spring-Run [Summer] Steelhead (Oncorhynchus mykiss gairdneri) [C1]

Anadromous Nongame Fish

Group Representative:

Pacific Lamprey

Group MIS Representative:

None identified

California Species of Special Concern on the Shasta-Trinity National Forests:

Sea-Run Pacific Lamprey (Lampetra tridentata tridentata) [C5]

Inland Coldwater Sportfish

Group Representatives:

Brook Trout
Brown Trout
Rainbow Trout

Group MIS Representative:

Rainbow Trout

California Species of Special Concern on the Shasta-Trinity National Forests:

Resident Rainbow Trout (Oncorhynchus mykiss gairdneri) [C5]

Inland Threatened, Endangered, & Sensitive Sportfish

Group Representatives:

Bull Trout
Redband Trout [Emphasis Species]

Group MIS Representative:

None identified

California Species of Special Concern on the Shasta-Trinity National Forests:

Bull Trout (Salvelinus confluentus) [extinct]
McCloud River Redband Trout (Oncorhynchus mykiss ssp.) [C3]

Inland Coldwater Nongame Fish

Group Representatives:

Rough Sculpin

Group MIS Representative:

None identified

California Species of Special Concern on the Shasta-Trinity National Forests:

Klamath Smallscale Sucker (Catostomus rimiculus) [C5]
Klamath Speckled Dace (Rhinichthys osculus klamathensis) [C5]
Riffle Sculpin (Cottus gulosus) [C5]
Rough Sculpin (Cottus asperrimus) [ST]

Sacramento Hitch (Lavinia exilicauda exilicauda) [C5]

Inland Warmwater Sportfish

Group Representatives:

Largemouth Bass
Smallmouth Bass

Group MIS Representative:

Largemouth Bass

California Species of Special Concern on the Shasta-Trinity National Forests:

None identified

Inland Warmwater Nongame Fish

Group Representative:

None identified

Group MIS Representative:

None identified

California Species of Special Concern on the Shasta-Trinity National Forests:

None identified

Species Of Special Concern Classification

Class 1 Species [C1]

These are taxa that seem to conform to the state definitions for threatened or endangered species. They should be added to the official list (i.e., spring-run [summer] steelhead.)

Class 2 Species [C2]

These are taxa having populations that are low, scattered, or highly localized. Their populations have declined in abundance in recent years, and they require management to prevent them from becoming threatened species (i.e., spring-run chinook.)

Class 3 Species [C3]

These are uncommon taxa occupying much of their natural range. They were formerly more abundant, but they still have pockets of abundance within their range. These species should be monitored periodically to see if their decline is accelerating. Taxa with very restricted, but stable, distributions are also included here, (i.e., Coho salmon and McCloud River redband trout).

Class 4 Species [C4]

These fishes have declined in abundance within their native range, but they have been introduced and established in greater numbers outside their native range. Special management is required to prevent loss of native populations.

Class 5 Species [C5]

These are common or widespread taxa whose populations appear stable or increasing in the face of habitat alterations, (i.e. resident rainbow trout and winter-run steelhead.)

Table G-2
Threatened, Endangered, and Sensitive Species on the Shasta-Trinity National Forests*

Amphibians

California red-legged frog (Rona aurora draytoni) - FC2
Shasta salamander (Hydromantes shastae) - ST

Birds

bald eagle (Haliaeetus leucocephalus) - FE, SE
peregrine falcon (Falco peregrinus) - FE, SE
spotted owl (Strix occidentalis) - FT
goshawk (Accipiter gentilis) - FS
willow flycatcher (Empidonax traillii) - FS

Fishes

bull trout (Salvelinus confluentus) - State extinct
McCloud River redband trout (Oncorhynchus mykiss) - ST emphasis
rough sculpin (Cottus asperrimus) - ST
spring-run chinook salmon (Oncorhynchus tshawytscha) - ST emphasis
spring-run steelhead (Oncorhynchus mykiss) - FS

Mammals

Pacific western big eared bat (Plecotus townsendii) - FC2
marten (Martes americana) - FS
fisher (Martes pennanti) - FS
Sierra Nevada red fox (Vulpes fulva) - ST, FS (may not occur on the Shasta-Trinity National Forests)
White-footed vole (Arborimus albipes) - FC2

Invertebrates

Franklin's bumble bee (Bombus franklini) - FC2
Klamath Mountains ground beetle (Nebria sahlbergii triad)-FC2

Siskyou ground beetle (Nebria gebleri siskiyouensis)-FC2
Trinity bristle snail (Monadenia setosa) - ST

* FE = Federally Endangered

  FT = Federally Threatened

  FC2 = Federal Candidate 2

  SE = State Endangered

  ST = State Threatened

  FS = Forest Service Sensitive

  S-T Emphasis = Shasta-Trinity National Forest Emphasis

Table G-3
Wildlife Species Assemblages as Management Indicators

The following lists are of species assemblages or species that are highly associated with the habitats and habitat components on the Shasta-Trinity National Forests (see literature references on the last page of this Appendix).
** Indicates the species recommended for monitoring.

Late Seral Stage (4a, 4bc, and 4c-older)

	Common Name	Scientific Name
**	Northern spotted owl	Strix occidentalis
**	Northern goshawk	Accipiter gentilis
	pileated woodpecker	Dryocopus pileatus
	Hammond's flycatcher	Empidonax hammondii
	brown creeper	Certhia familiaris
	golden-crowned kinglet	Regulus satrapa
	ruby-crowned kinglet	Regulus calendula
	hermit warbler	Dendroica occidentalis
**	fisher	Martes pennanti
**	marten	Martes americanus
	Trowbridge shrew	Sorex trowbridgii
	Northern flying squirrel	Glaucomys sabrinus

Openings And Early Seral Stage (meadows, and plantation stages 1 & 2) (Does not include chaparral community.)

	Common Name	Scientific Name
	Western fence lizard	Sceloporus occidentalis
	racer	Coluber constrictor
	Western spadefoot toad	Scaphiopus hammondi
	Western meadowlark	Sturnella neglecta
	turkey (multi-habitat assemblage)	Meleagris gallopavo
	dark-eyed junco	Junco hyemalis oreganus
	white-crowned sparrow	Zonotrichia albicollis
	lark sparrow	Chondestes grammacus
	mountain quail	Oreortyx pictus
	fox sparrow	Passerella iliaca
	California quail	Lophortyx californicus
**	song sparrow (shrub stage)	Melospiza melodia
**	Western harvest mouse (bush/shrub stage)	Reithrodontomys megalotis
	brush mouse	Peromyscus boylii
	bear (multi-habitat assemblage)	Ursus americanus
	pinyon mouse	Peromyscus truei
	deer (multi-habitat assemblage)	Odocoileus hemionus
**	California vole (grass/forb stage)	Microtus californicus
	long-tailed vole (shrub stage)	Microtus longicaudus
	black-tailed jackrabbit	Lepus americanus
	brushrabbit	Sylvilagus bachmani

Openings and Early Seral Stage (continued)

	striped skunk	Mephitis mephitis
	Botta's pocket gopher	Thomomys umbrinus
	mountain pocket gopher (northeast distribution)	Thomomys monticola
	California kangaroo rat	Dipodomys californicus

Multi-Habitat

	Common Name	Scientific Name
**	mule deer	Odocoileus hemionus
**	elk	Cervus canadensis
**	black bear	Ursus americanus
**	turkey	Meleagris gallopavo
	wolverine	Gulo gulo

Snag and Down Log

	Common Name	Scientific Name
	long-toed salamander (north Shasta side)	Ambystoma macrodactylum
	ensatina	Ensatina eschscholtzi
	sagebrush lizard	Sceloporus graciosus
	rubber boa	Charina bottae
	sharp-tailed snake	Contia tenuis
	Calif mountain king snake	Lampropeltis zonata
	ruffed grouse (west side only)	Bonasa umbellus
**	Western screech owl	Otus asio
**	Northern pygmy owl	Glaucidium gnoma
**	Northern saw-whet owl	Aegolius acadicus
	Vaux's swift	Chaeturi vauxi
	Northern flicker	Colaptes auratus
**	pileated woodpecker	Dryocopus pileatus
	Lewis' woodpecker	Melanerpes lewis
	Williamson's sapsucker	Sphyrapicus thyroideus
	hairy woodpecker	Picoides villosus
	downy woodpecker	Picoides pubescens
	Nuttall's woodpecker (riparian decidous and oak)	Picoides nuttallii
	ash-throated flycatcher	Myiarchus cinerascens
	violet-green swallow	Tachycineta thalassina
**	tree swallow	Tridoprocne bicolor
	mountain chickadee	Parus gambeli
	chestnut-backed chickadee	Parus rufescens
	plain titmouse	Parus inornatus
	red-breasted nuthatch	Sitta canadensis
	white-breasted nuthatch	Sitta carolinensis
	Bewick's wren	Thryomanes bewickii
	pygmy nuthatch	Sitta pygmaea
	mountain bluebird	Sialia currucoides

Snag and Down Log (continued)

	Western bluebird	Sialia mexicana
	silver-haired bat	Lasionycteris noctivagans
	long-eared myotis	Myotis evotis
	long-legged myotis	Myotis volans
	ermine	Mustela erminea
	mink	Mustela vison
	Western red backed vole	Clethrionomys californicus
	porcupine	Erethizon dorsatum
**	black bear	Ursus americanus

Riparian (indicator of vegetation)

	Common Name	Scientific Name
**	California red legged frog	Rana aurora
	Pacific tree frog	Hyla regilla
	Pacific giant salamander	Dicamptodon ensatus
**	black salamander	Aneides flavipunctatus
	house wren	Troglodytes aedon
	solitary vireo	Vireo solitarius
	yellow warbler	Dendroica coronata auduboni
	common yellow throat	Geothlypis trichas
	yellow breasted chat	Icteria virens
	Wilson's warbler	Wilsonia pusilla
	red winged blackbird	Agelaius phoeniceus
	blackheaded grosbeak	Pheucticus melanocephalus
**	willow flycatcher	Empidonax traillii
	Cooper's hawk	Accipiter cooperii
	raccoon	Procyon lotor
	Virginia opposum	Didelphis marsupialis
	Marsh Shrew	Sorex bendirii
	shrew mole	Neurotrichus gibbsii
	broad-footed mole	Scapanus latimanus
	little brown bat	Myotis lucifugus
	yuma myotis	Myotis yumanensis
	fisher	Martes pennanti
	mountain beaver	Aplodontia rufa
	beaver	Castor canadensis

Aquatic (conditions monitored by riparian and fish)

Common Name	Scientific Name
tailed frog	Ascaphus truei
Cascades frog	Rana cascade
foothill yellow-legged frog	Rana boylei
long-toed salamander	Ambystoma macrodactylum
Olympic salamander	Rhycotriton olympicus

Aquatic (continued)

Western aquatic garter snake	Thamnophis couchi
Western pond turtle	Clemmys marmorta
osprey	Pandion haliaetus
bald eagle	Haliaetus leucocephalus
belted kingfisher	Megaceryle alcyon
great blue heron	Ardea herodias
green-backed heron	Butorides striatus
black-crowned night-heron	Nycticorax nycticorax
great egret	Casmerodius albus
common merganser	Mergus merganser
common goldeneye	Bucephala clanqula
mallard	Anas platyrhynchos
wood duck	Aix sponsa
river otter	Lutra canadensis
water shrew	Sorex palustris
muskrat	Ondatra zibethica

Hardwoods

	Common Name	Scientific Name
**	acorn woodpecker	Melanerpes formicivorous
	Nutall's woodpecker	Picoides nuttallii
	Lewis' woodpecker	Melaneroes lewis
	scrub jay	Aphelocoma coerulescens
	plain titmouse	Parus inornatus
	white breasted nuthatch	Sitta carolinensis
	Hutton's vireo	Vireo huttoni
	evening grosbeak	Hesperiphona vespertina
	black bear (multi habitat)	Ursus americanus
	blue-gray gnatcatcher	Polioptila caerulea
	red-tailed hawk	Buteo jamaicensis

Chaparral

	Common Name	Scientific Name
	sagebrush lizard	Sceloporus graciosus
**	green-tailed towhee	Pipilo chlorurus
	golden eagle	Aquila chrysaetos
	prairie falcon	Falco mexicanus
	wrentit	Chamaea fasciata
	bushtit	Psaltriparus minimus
	California thrasher	Toxostoma redivivum
	mountain lion	Felis concolor
	Great Basin pocket mouse	Pergnathus parvus
	Western spotted skunk	Spilogale putorius

Cliffs, Caves, Talus, and Rock Outcrops

Common Name	Scientific Name
Shasta salamander (limited limestone areas)	Hydromantes shastae
rock wren	Salpinctes obsoletus
canyon wren	Catherpes mexicanus
peregrine falcon	Falco peregrinus
Townsend's big-eared bat	Plecotus townsendii
pika (east side)	Ochotona princeps
California myotis	Myotis californicus
fringed myotis	Myotis thysanodes
Brazilian free-tailed bat	Tadarida brasiliensis
bushy tailed woodrat	Neotoma cinerea

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Table G-4
Sensitive and Endemic Plant List

Scientific Name / Common Name	Range on Shasta-Trinity Districts	Mgt. Areas	Elevation (in feet)	Habitat
Sensitive Plants Known to Occur on the Shasta-Trinity National Forests				
Arctostaphylos klamathensis Klamath manzanita	Mt. Shasta Weaverville?	5	5500-6500	Montane mixed conifer forest, serpentine & gabbro soils; Scott and Trinity Mountains.
Calochortus longebarbatus var.longebarbatus Long-haired star-tulip	McCloud	2	3000-4300	Wet meadows within pine forest or sagebrush communities.
Campanula shetleri Castle Crags harebell	Mt. Shasta	4,5	3600-6000	Granite and diorite cliffs; north and northeast exposures.
Campanula wilkinsiana Wilkins harebell	McCloud Mt. Shasta Weaverville	3,4	5500-8600	Streambanks and springs in red fir and subalpine forests.
Collomia larsenii (=C. debilis var. larsenii) talus collomia	McCloud	1	7200 +	Cinder and scree slopes.
Cordylanthus tenuis ssp. pallescens pallid bird's beak	Mt.Shasta	3,5	3600-5200	Lightly disturbed openings in ponderosa pine forest; gravelly volcanic or ultramafic soils.
Draba aureola Golden draba	Mt. Shasta	5	7000-9000	Among rocks on ridges, fell-fields; subalpine forests.
Draba carnosula Mt. Eddy draba	Mt. Shasta	5,6	7600-8400	Alpine and subalpine boulder fields and rock outcrops.
Epilobium siskiyouense Siskiyou fireweed	Mt. Shasta	5,6	5000-8000	Exposed, rocky serpentine ridges and slopes.
Eriastrum brandegeae (includes E. tracyi) Brandegee's eriastrum	Hayfork	18	1000-2600	Dry, gravelly, flat openings in chaparral, foothill woodland.

* Information in this list is current as of March 1993.
? Suspected to occur or not currently documented.

Table G-4 (continued)

Scientific Name Common Name	Range on Shasta-Trinity Districts	 Mgt. Areas	Elevation (in feet)	Habitat
Eriogonum alpinum Trinity buckwheat	Mt. Shasta Weaverville?	5	6700-9000	Exposed serpentine ridges and talus slopes.
Eriogonum umbellatum var. humistratum Mt. Eddy buckwheat	Mt. Shasta	5	5700-9000	Serpentine slopes and outcrops within mixed conifer forest or subalpine; Scott and Trinity Mountains.
Erythronium citrinum** var. roderickii Scott Mountain fawn lily	Weaverville	4,8	900-4000?	Mixed conifer forest; Scott Mountains. Serpentine & granitic soils (?)
Swertia fastigiata (incl. Frasera umpquaensis) Umpqua green gentian	Hayfork Yolla Bolla Big Bar?	20	4000-6000	Meadows, springs, openings in Douglas-fir/white fir forest.
Galium serpenticum ssp. scotticum Scott Mountain bedstraw	Mt. Shasta Weaverville	4,6	5100-7600	Serpentine talus slopes, rock outcrops in mixed conifer forest.
Ivesia pickeringii Pickering's ivesia	Weaverville	6	2500-4500	Seasonally wet serpentine meadows and swales.
Lewisia cotyledon var. heckneri Heckner's lewisia	Big Bar Mt. Shasta Weaverville	4,7	2500-8000	Moist rock outcrops in chaparral, oak or conifer forest.
Lewisia cotyledon var. howellii Howell's lewisia	McCloud Shasta Lake	10,12	500-4500	Rock outcrops in chaparral, oak or conifer forests.
Linanthus nuttallii ssp. howellii Howell's linanthus	Yolla Bolla	22	4000-5000	Jeffrey pine woodlands; mostly on serpentine soils.
Madia doris-nilesiae Niles' madia	Hayfork	19	2600-4400	Rocky serpentine slopes and openings in Jeffrey pine woodland.

** Plants recommended to the Regional Forester for addition to the sensitive species list, but not listed as of March 1993.
? Suspected to occur or not currently documented.

Table G-4 (continued)

Scientific Name Common Name	Range on Shasta-Trinity Districts	 Mgt. Areas	Elevation (in feet)	Habitat
Madia stebbinsii Stebbins' madia	Yolla Bolla	21,22	4000-5000	Rocky serpentine openings in chaparral, Jeffrey pine forest.
Minuartia rosei Peanut sandwort	Hayfork Yolla Bolla	18,19,21	2500-5800	Rocky serpentine slopes and openings in Jeffrey pine and mixed conifer forest.
Neviusia cliftonii** Shasta snow-wreath	Shasta Lake	8,12	2400-3000?	North-facing slopes on limestone-derived soils, within riparian areas.
Penstemon filiformis Thread-leaved penstemon	Mt. Shasta Weaverville	4-7,9	2000-6000	Meadows and lightly disturbed openings; serpentine soils.
Penstemon tracyi Tracy's beardtongue	Big Bar Weaverville	4	6000-8000	Rock cliffs and outcrops; Trinity Alps
Phacelia cookei Cooke's phacelia	Mt. Shasta	3	4100-5000	Lightly disturbed volcanic sand.
Phacelia dalesiana Scott Mountain phacelia	Mt. Shasta Weaverville	4-6,9	5000-7000	Meadows and openings in red fir forest; serpentine soils.
Phacelia greenei Scott Valley phacelia	Weaverville	6	5000-7000	Gravelly serpentine slopes and forest openings.
Potentilla cristae crested or Klamath potentilla	Mt. Shasta	4,5	7000-9000	Rocky slopes and ridges in depressions where snow lingers; serpentine or basic substrate.
Raillardella pringlei showy raillardella	Mt. Shasta Weaverville	4-6	4000-7500	Wet serpentine meadows, seeps and streambanks.
Raillardiopsis scabrida (=Raillardella scabrida) rough raillardella	Shasta lake Yolla Bolla?	11	5500-7500	Rocky, open subalpine slopes.

** Plants recommended to the Regional Forester for addition to the sensitive species list, but not listed as of March 1993.
? Suspected to occur or not currently documented.

Table G-4 (continued)

Scientific Name Common Name	Range on Shasta-Trinity Districts	 Mgt. Areas	Elevation (in feet)	Habitat
Rorippa columbiae** Columbia cress	McCloud	2	500-4500?	Seasonal lakebeds and drainages east of the Cascades.
Sedum Laxum ssp. flavidum pale yellow stonecrop	Hayfork Yolla Bolla	18-20	2500-6000	Rock outcrops.
Sedum paradisum (=S. obtusatum ssp. p.) Canyon Creek stonecrop	Big Bar Shasta Lake ? Weaverville?	4	3800-6500	Granite outcrops
Silene invisa short-petaled campion	Weaverville Mt. Shasta?	4	5800-8000	Red fir and subalpine forest
Trillium ovatum ssp. oettingeri Salmon Mountains wakerobin	Weaverville McCloud	2,4,6,7,10,11	3900-6400	Moist, shady conifer forest, especially near streams and montane riparian scrub.
Trimorpha acris var. debilis (=Erigeron a. var d.) northern daisy	Mt. Shasta	4	7000 +	On Shasta-Trinity known only from Mt. Shasta; open rocky habitat above timberline.
Sensitive Plants Suspected to Occur on the Shasta-Trinity National Forests				
Botrychium pumicola pumice moonwort	Mt. Shasta (poex)		5500-9000?	Pumice slopes, sometimes in lodgepole pine forest.
Calochortus greenei Greene's mariposa lily	Mt. Shasta (poex)		4000-5000	Brushy openings in montane conifer forests.
Ivesia longibracteata Castle Crags ivesia	Mt. Shasta?		4400-4800	Granite and diorite outcrops near and above timberline.
Lewisia cantelovii Cantelow's lewisia	Mt. Shasta?		500-3000	Moist rock outcrops in broad-leaf and conifer forests.

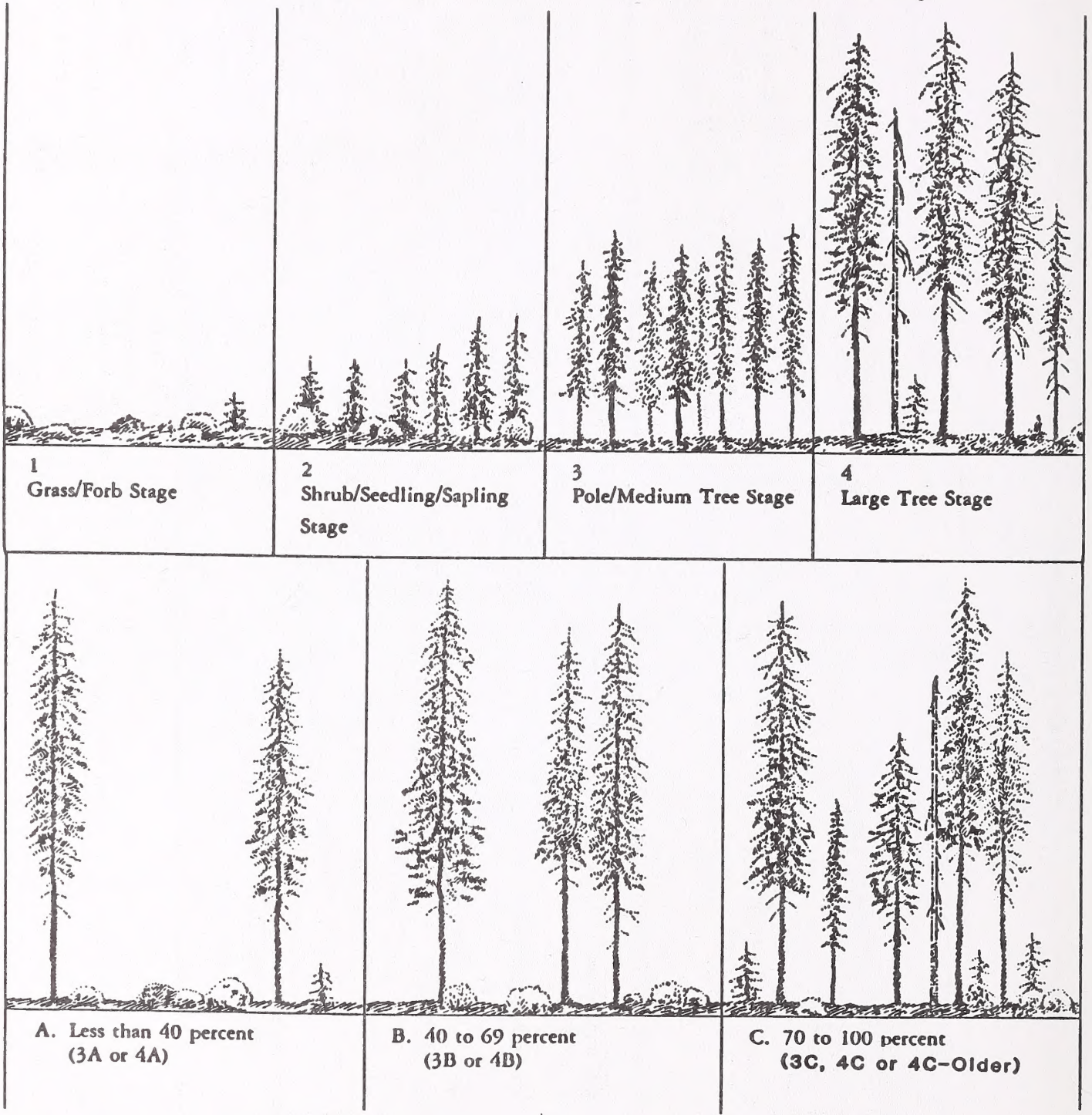
** Plants recommended to the Regional Forester for addition to the sensitive species list, but not listed as of March 1993.
? Suspected to occur or not currently documented.
poex Possibly extirpated (not relocated in recent times).

Table G-4 (continued)

Scientific Name Common Name	Range on Shasta-Trinity Districts	 Mgt. Areas	Elevation (in feet)	Habitat
Lomatium peckianum Peck's lomatium	Mt. Shasta?		2500 ?	Pine-oak woodland, often on ultramafic soil.
Minuartia decumbens The Lassics sandwort	Yolla Bolla?		5100	Jeffrey pine woodland; dry serpentine soil.
Ophioglossum vulgatum adder's-tongue fern	Mt. Shasta (poex)		1000 ?	Meadows, marshes, moist forests.
Puccinellia howellii Howell's alkali grass	Weaverville?		1500	Mineral seeps.
Endemic to the Shasta-Trinity National Forests (In addition to endemic sensitive species)				
Ageratina shastensis (=Eupatorium shastense) Shasta eupatory	Shasta Lake	8,10,12	2000-6000	Limestone outcrops
Arnica venosa veiny arnica	Shasta Lake Weaverville	7,8,12	1500-5000	Mixed conifer-hardwood forest with Douglas-fir, ponderosa pine, black oak; mostly north slopes & ridgetops.
Ericameria ophitidis (=Haplopappus ophitidis) serpentine macronema	Hayfork Yolla Bolla	19,21,22	2600-5600	Serpentine outcrops; open Jeffrey pine forest on serpentine soil.
Eriogonum libertini Dubakella Mountain buckwheat	Hayfork Yolla Bolla	19,21,22	2400-5500	Open Jeffrey pine forest on serpentine soil.

? Suspected to occur or not currently documented.
poex Possibly extirpated (not relocated in recent times).

Figure G-1
Seral Stage Descriptions Used For Wildlife Habitat Relationships



1 - Grass-Forb Stage

2 - Shrub/Seeding/Sapling Stages

3a- Pole/Medium Tree Stage, <40% Canopy Closure

3b- Pole/Medium Tree Stage, 40 to 70% Canopy Closure

3c- Pole/Medium Tree Stage, <70% Canopy Closure

4a- Large Tree Stage, <40% Canopy Closure

4b- Large Tree Stage, 40 to 70% Canopy Closure

4c- Large Tree Stage, >70% Canopy Closure

4c- Older - old growth, Same as 4c large tree stage, but exhibiting obvious signs of decadence.

Figure G-2
Diversity Decision Flow Chart

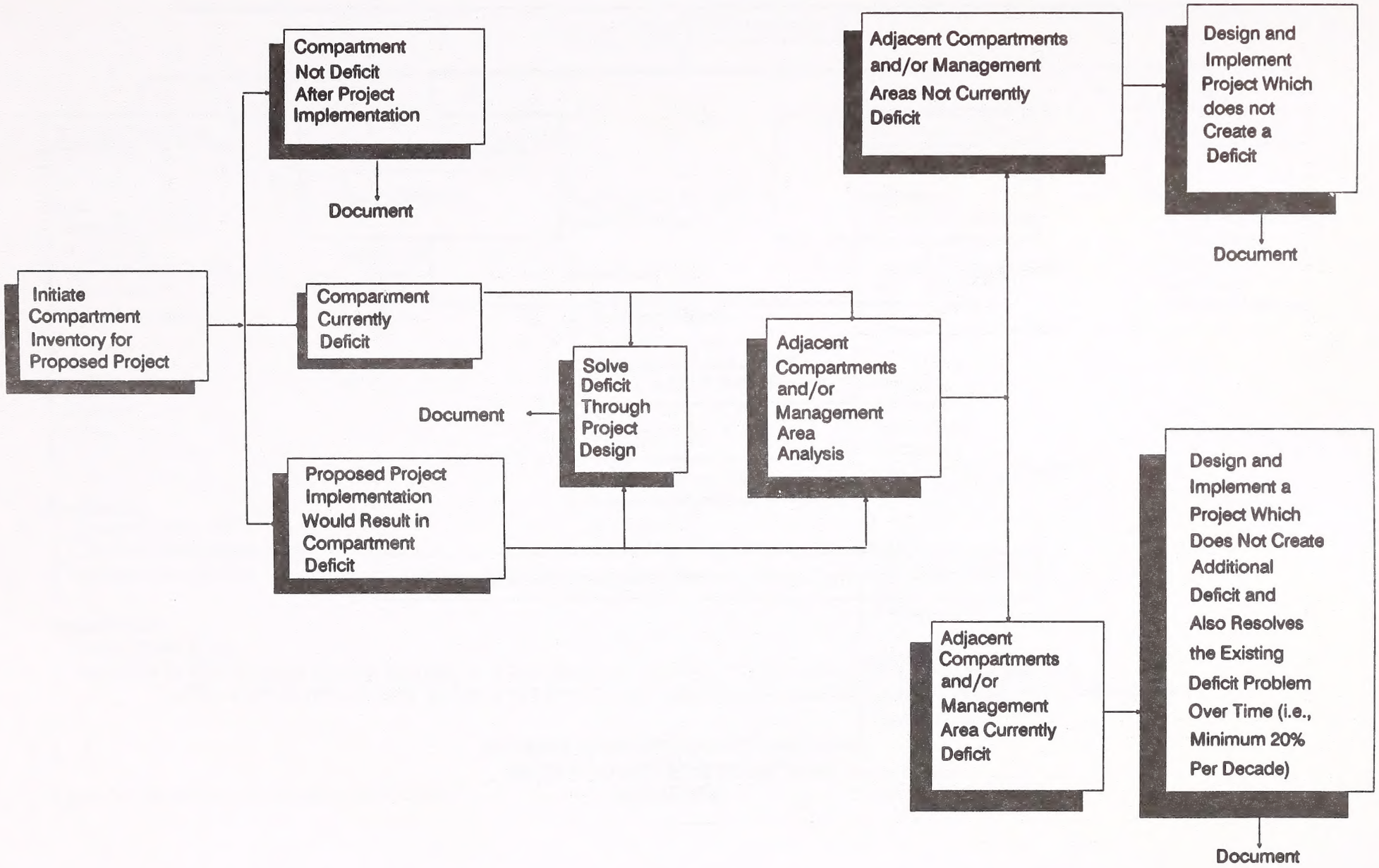


Figure G-3
Shasta - Trinity National Forests
Wildlife/ Fisheries/ Botany Programs

Program Guided by National, Regional and Forest Policy, Management Direction, Mission Statements, Programs like "RISE TO THE FUTURE" & "LET'S GET WILD", Forest Goals & Objectives, Species Priorities, etc..

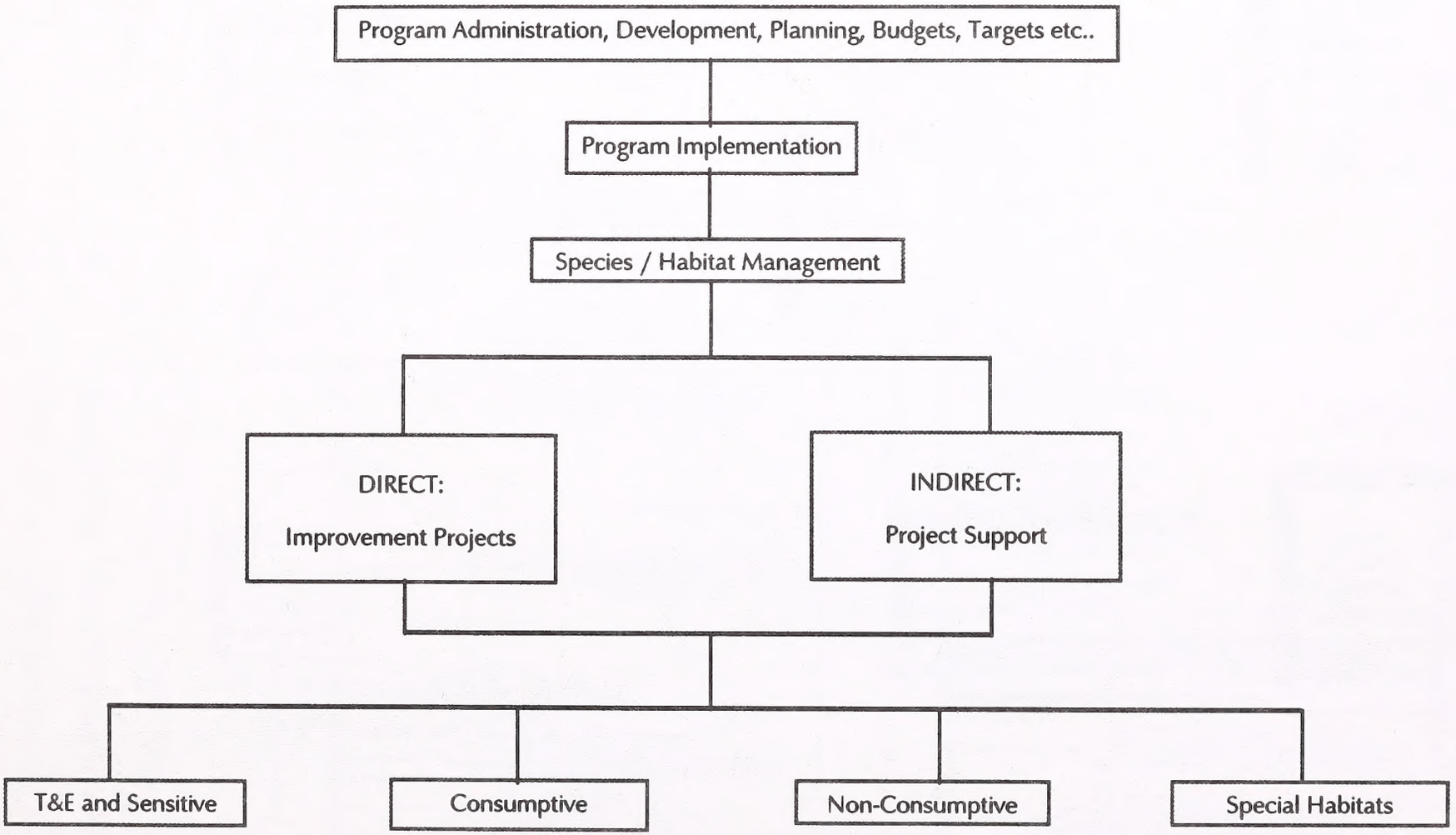
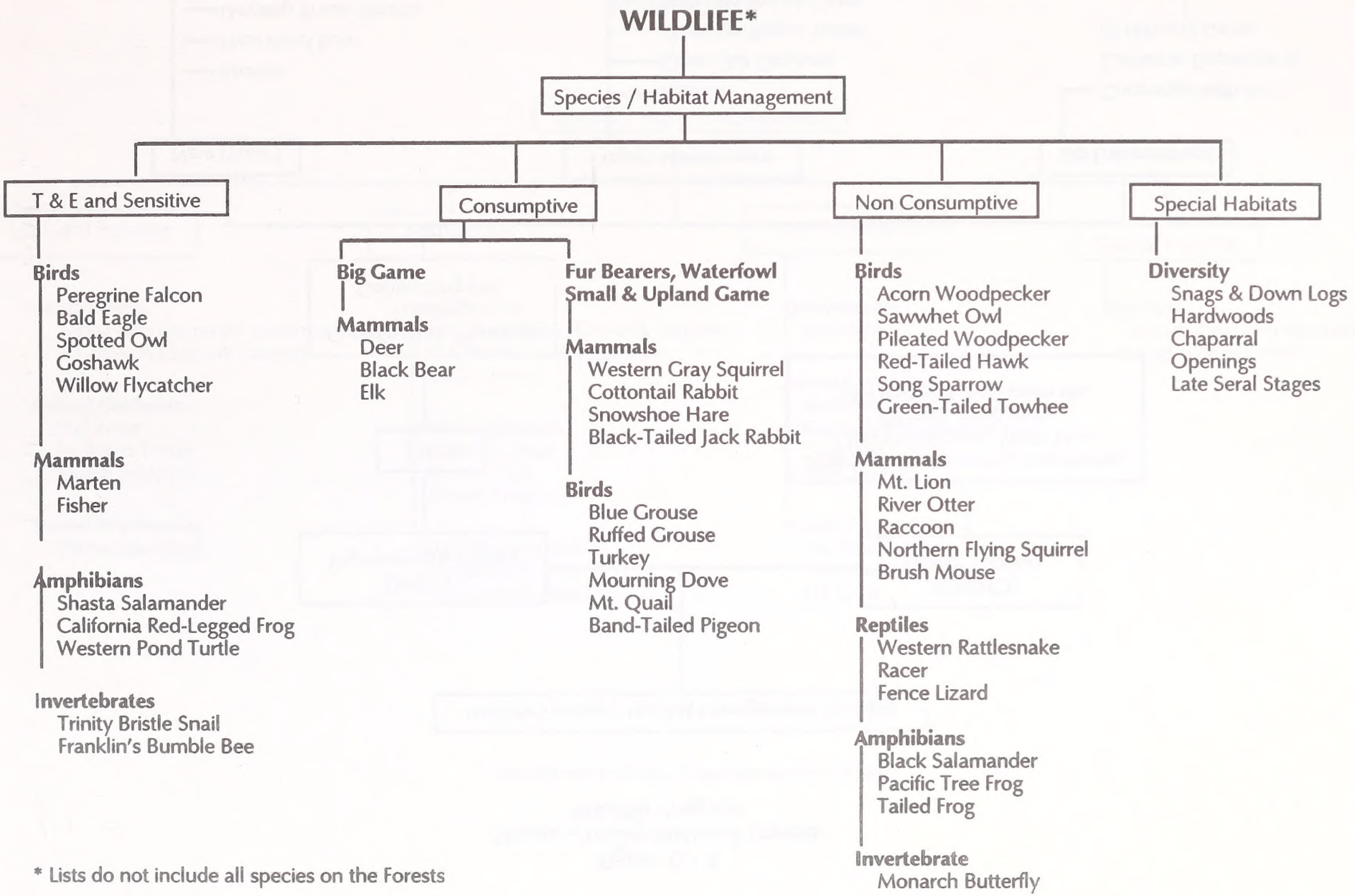


Figure G - 4
Shasta - Trinity National Forests
Wildlife / Fisheries / Botany Programs



* Lists do not include all species on the Forests

Figure G - 5
Shasta - Trinity National Forests
Wildlife Program

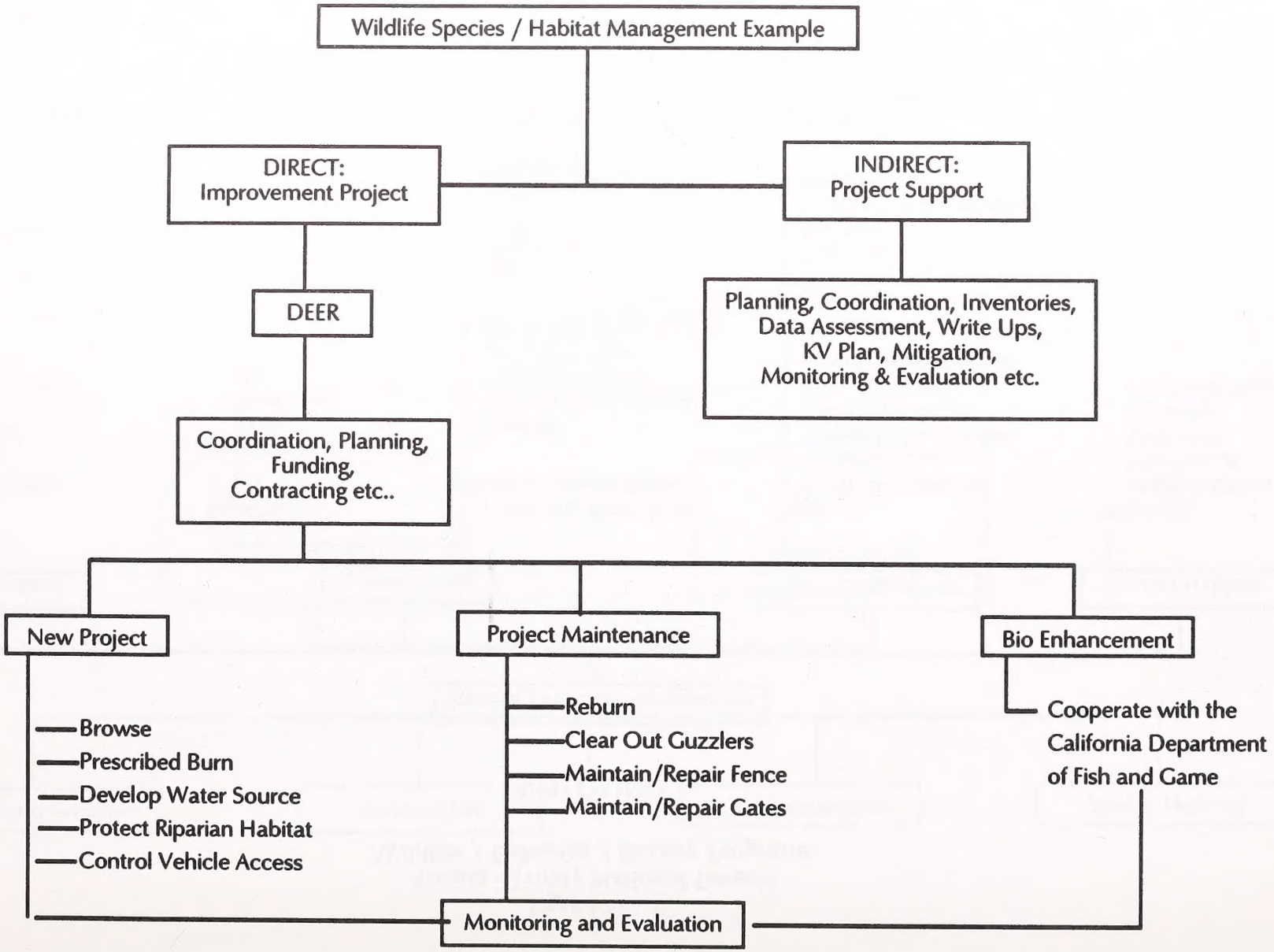
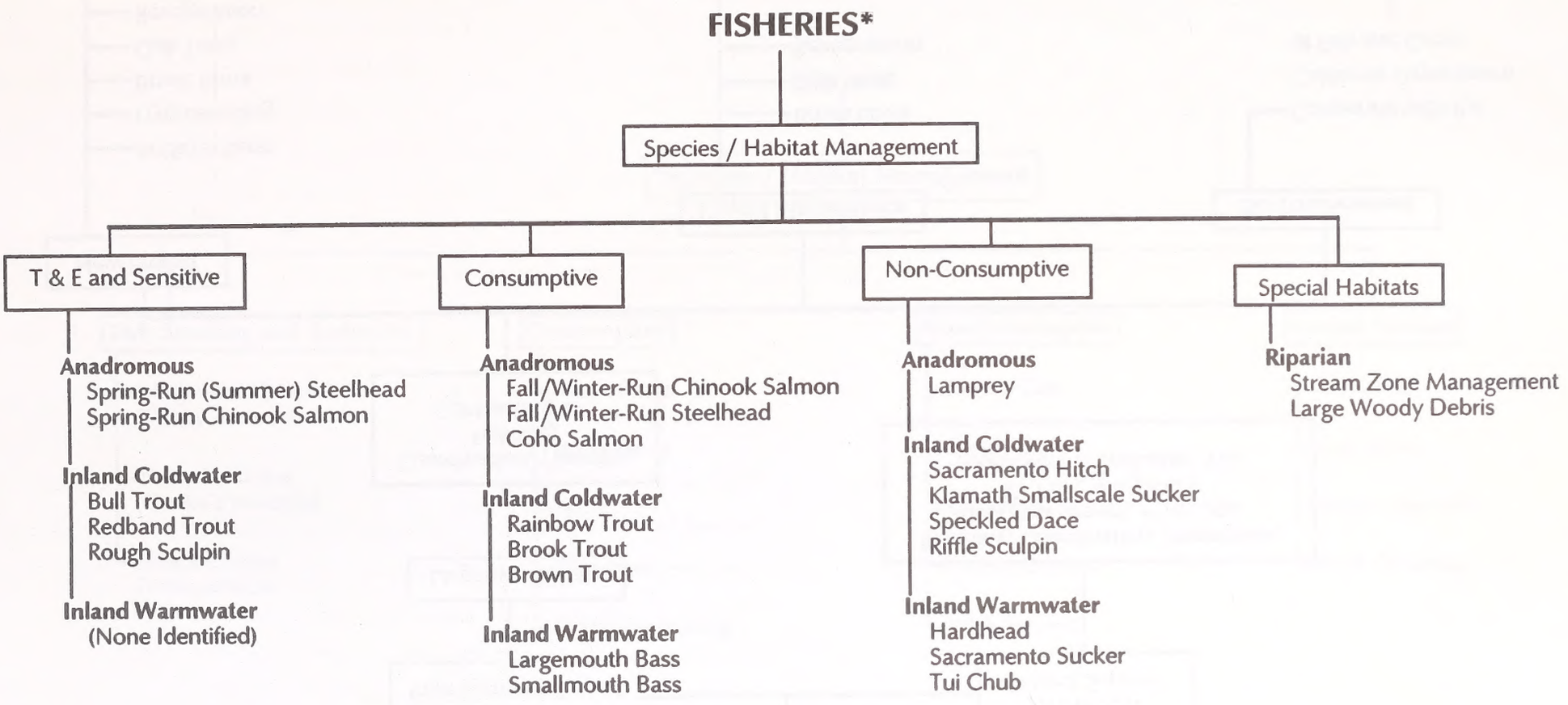


Figure G - 6
Shasta - Trinity National Forests



* Lists do not include all species on the Forests

Figure G - 7
Shasta - Trinity National Forests
Fisheries Program

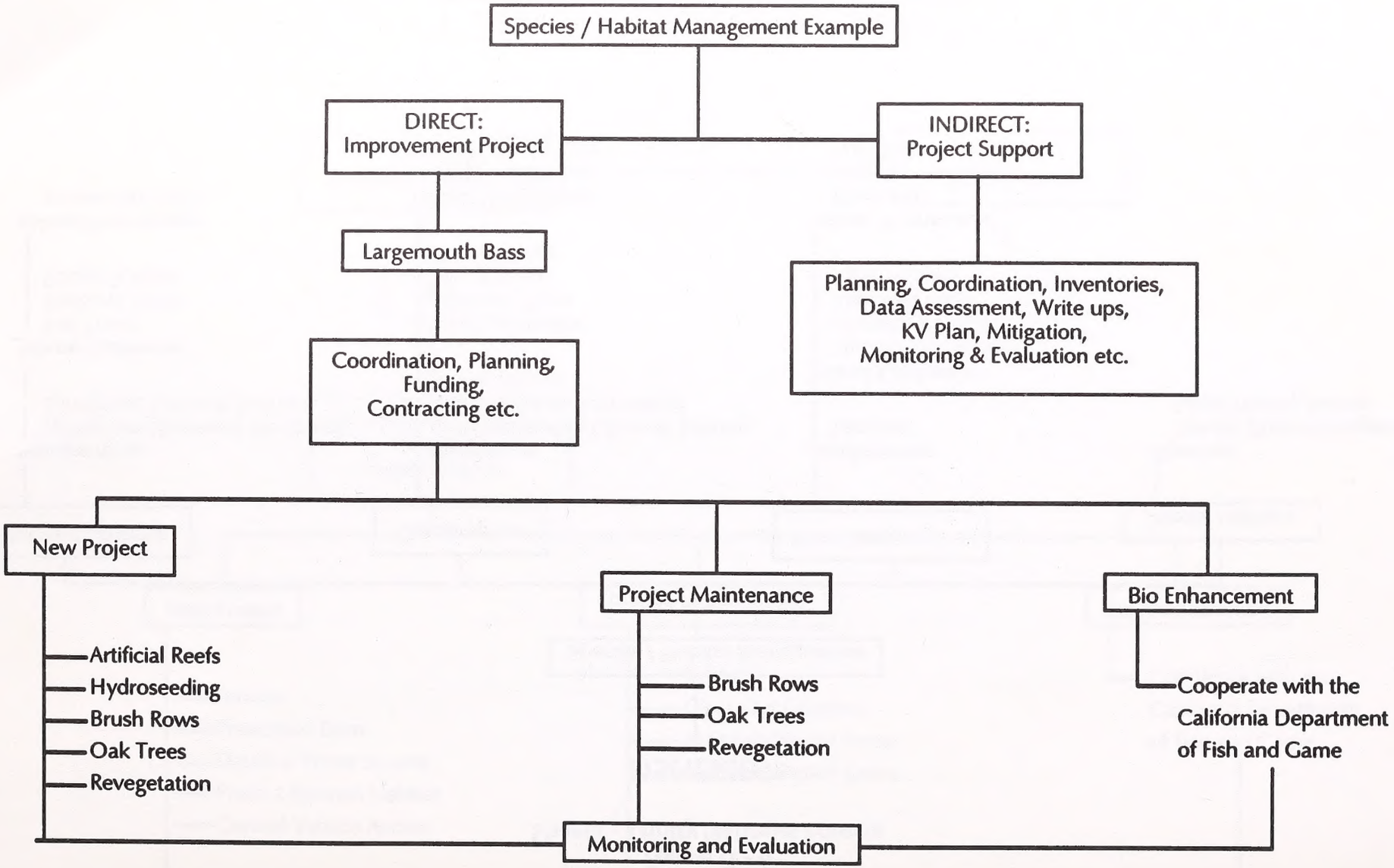
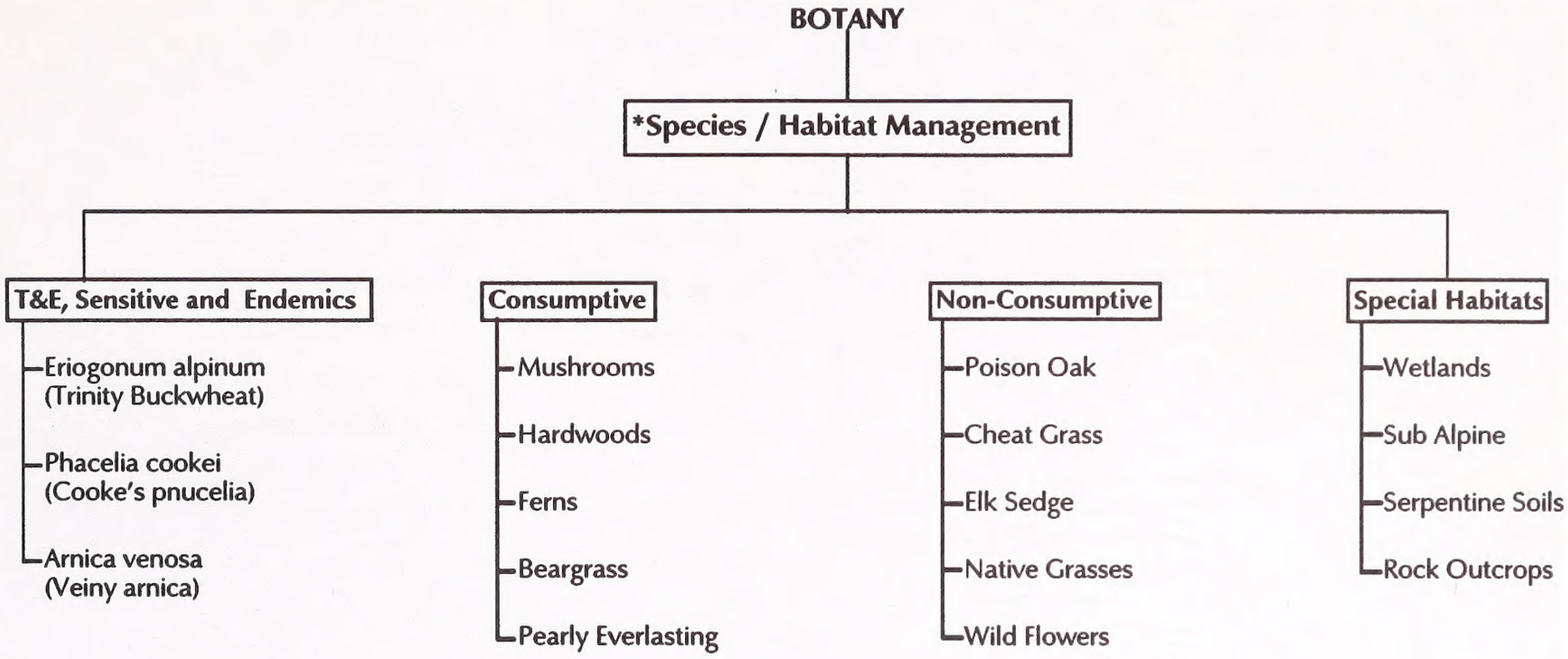
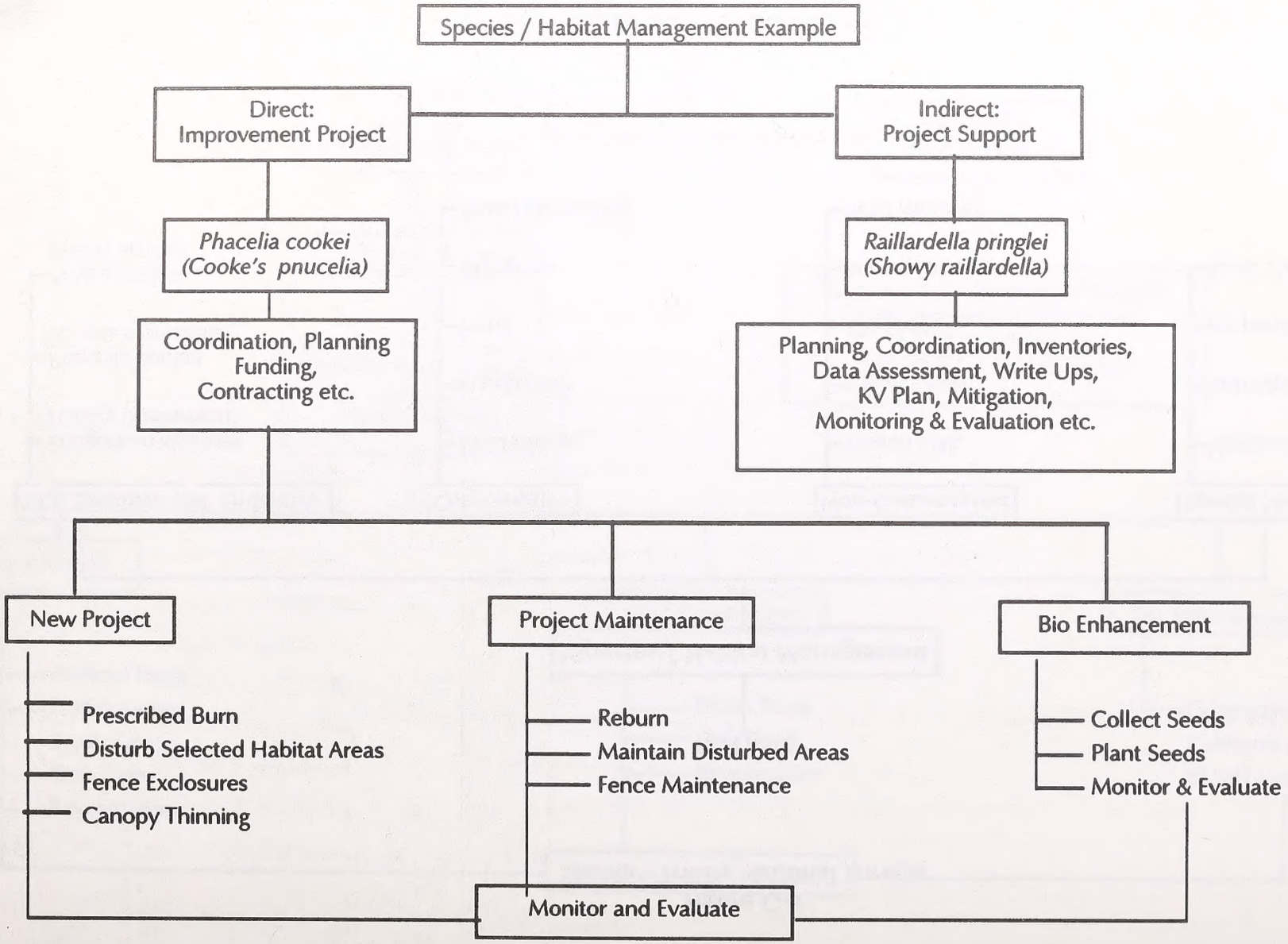


Figure G-8
Shasta - Trinity National Forests



** Lists do not include all species on the Forests.*

Figure G-9
Shasta-Trinity National Forests
Botany Programs



APPENDIX H

Watershed Condition/Cumulative Watershed Effects

APPENDIX H
Watershed Condition/Cumulative Watershed Effects

Watershed condition, as described in the Forest Service Manual Section 2521, is a description of the health of a watershed, or portion thereof, in terms of the factors which effect hydrologic function and soil productivity. Hydrologic function includes the quality, quantity, and discharge characteristics of surface and groundwater resources. Soil productivity is the capacity of a soil for producing a plant community or sequence of plant communities under a specified system of management.

The concept of watershed condition was conceived because watershed scientists and managers desired to have a holistic appraisal of a watershed, based on integrated soil, water, geologic, vegetative, and management factors. There are a number of factors which influence watershed condition, natural and/or human induced, which can have either a negative or positive effect. Examples of these factors include changes in peak streamflows, erosion (sheet, rill, and mass wasting), soil compaction, and deforestation. Additionally, the cumulative effects of management activities, including the relative timing, location, type and level of activities are significant because they can affect any of the above factors.

In watershed management in Northern California, the primary concerns are impacts resulting in: (1) increases in erosion and sedimentation rates related to management activities which lead to decreased soil productivity and water quality; (2) factors which may lead to deleterious changes in stream channel condition, including road and harvest unit related impacts to peak streamflows; and (3) compacted areas, including roads, landings, and skid trails, which reduce site productivity and take land out of production.

Successive and increasing amounts of soil disturbance and compaction decrease soil productivity and increase erosion and peak streamflows through increased surface runoff, interception of subsurface runoff, and more rapid delivery of runoff and sediment to stream channels. Increased peak streamflows result in greater sediment carrying capability, which allows for the mobilization of stored sediment. Additionally, higher streamflows contribute to channel margin undercutting and downcutting, which often lead to valley inner gorge landsliding. Sediment derived from these processes is transported and eventually deposited downstream, much to the detriment of fish habitat. In order to monitor watershed condition over time, some system of measure is needed which considers these factors.

The probable effects of implementation of each of the alternatives on watershed condition was evaluated in terms of the potential for initiating cumulative watershed effects. Cumulative effects are a function of: (1) the amount of sensitive ground and its hazard level within a watershed; (2) the level of management activities; and (3) the location of impacts relative to hazardous areas. In the proposed Forest Plan and this Draft EIS, both the amount of sensitive ground present within a watershed and the level of past and present harvesting activities were evaluated.[1]

Sixty-one fourth and fifth-order watersheds were identified on the Forests. They range in size from 11 to 410 square miles. The available data base utilized to evaluate cumulative effects was the third-order Soil Resource Inventory, a harvest history of the Trinity Forest, a Forest-wide Water Resource Inventory, and a third-order Geologic Resource Inventory.

1 Haskins, D.M., 1986, A Management Model for Evaluating Cumulative Watershed Effects; Proceedings from the California Watershed Management Conference, West Sacramento, CA, November 18-20, 1986, pp 125-130

The following factors were used to assess each watershed's sensitivity to cumulative effects: (1) slope gradient, (2) soil erodibility, (3) mass wasting potential, and (4) the peak streamflow characteristics of each watershed. These factors were weighted through a calibration process, and combined through a simple equation yielding a sensitivity index. This sensitivity index ranged from 5 to 66, and served well in contrasting highly unstable, sensitive watersheds from low hazard, non-sensitive watersheds. According to their sensitivity index, the 61 watersheds were grouped into low, moderate, high and extreme sensitivity classes.

The second factor in cumulative watershed effects, the level of management activities, was determined using the equivalent road area (ERA) method. This is simply an accounting system used to normalize all forms of management activities which have occurred in different time periods. The common denominator is the disturbed and compacted area of any activity related to an area of road. It is used to normalize the disturbances from roads, skid trails, landings, cableways, and site preparation activities and their influence on peak streamflow and sediment delivery.

Recent studies[2] [3] have shown that there are management level thresholds within watersheds, where if exceeded, the risk of cumulative effects increase dramatically. For high risk or extremely sensitive watersheds, various workers have defined a threshold of from 12 percent to 15 percent ERA. It is apparent that watersheds having only small areas of sensitive ground and therefore, a low sensitivity index, can withstand greater levels of management activity without undergoing cumulative watershed effects. Therefore, different thresholds have been defined for the different sensitivity classes: 12 percent ERA for extremely sensitive, 14 percent ERA for highly sensitive, 16 percent for moderate, and 18 percent for low sensitivity watersheds.

Thresholds in this methodology are not thought of as a point where if exceeded, erosion, sedimentation and water quality degradation will occur. They are instead treated as "red flags" or thresholds of concern (TOC) where, if exceeded, it is realized that the risk has increased significantly and mitigation measures should be implemented to protect against the onset of cumulative effects. Mitigation measures might include such things as increasing the size of culverts to carry potentially greater peak streamflows, rocking roads to reduce surface erosion, and wider riparian management zones to help insure their effectiveness. Therefore, a watershed projected to be over the TOC could still be managed, but special management practices would be recommended to decrease the risk of initiating cumulative effects and watershed condition degradation. It is also recognized that if the TOC is exceeded and mitigation measures are not employed, that the risk of initiating cumulative effects is significant and unacceptable.

The FORPLAN model calculates and accumulates ERAs Forest-wide. These are generated from timber harvest and road building activities. Through revegetation, re-establishment of surface cover and physical processes such as frost heaving, disturbed and compacted areas gradually recover. To account for this, the calculated harvest ERA value is recovered linearly over a 30 year period in the model. However, a residual ERA value is retained to account for system roads which do not recover over time.

This methodology is linked to watershed condition through classifying watershed condition in terms of the level of ERAs for individual watersheds with respect to their individual TOC. The classes are defined as follows:

Class 1
ERA is less than 40 percent of TOC (watershed condition is at or near potential).

Class 2
ERA is between 40 and 80 percent of TOC (watershed condition is between near potential and a point near tolerance).

Class 3
ERA is greater than 80 percent of TOC (watershed condition is near or below tolerance).

Field experience indicates that Class 1 watersheds, having ERA levels lower than 40 percent of their individual TOC, are generally in excellent condition. Within the hundreds of subwatersheds that together comprise the typical fifth-order watershed, stream channel conditions are generally good to excellent, and soil productivity is maintained at optimal levels. Water quality generally exceeds objectives. Within the subwatersheds, there is generally only a low potential for degraded water

2 Coats, R.N., Miller, T.O., Kallstom, D.W., 1979, Assessing Cumulative Effects of Silvicultural Activities. John Muir Institute. Napa, CA.

3 Seidelman, P.J., 1980, Methodology for Evaluating Cumulative Watershed Impacts, U.S. Forest Service, Watershed Management, Pacific Southwest Region, Dept. of Agric.

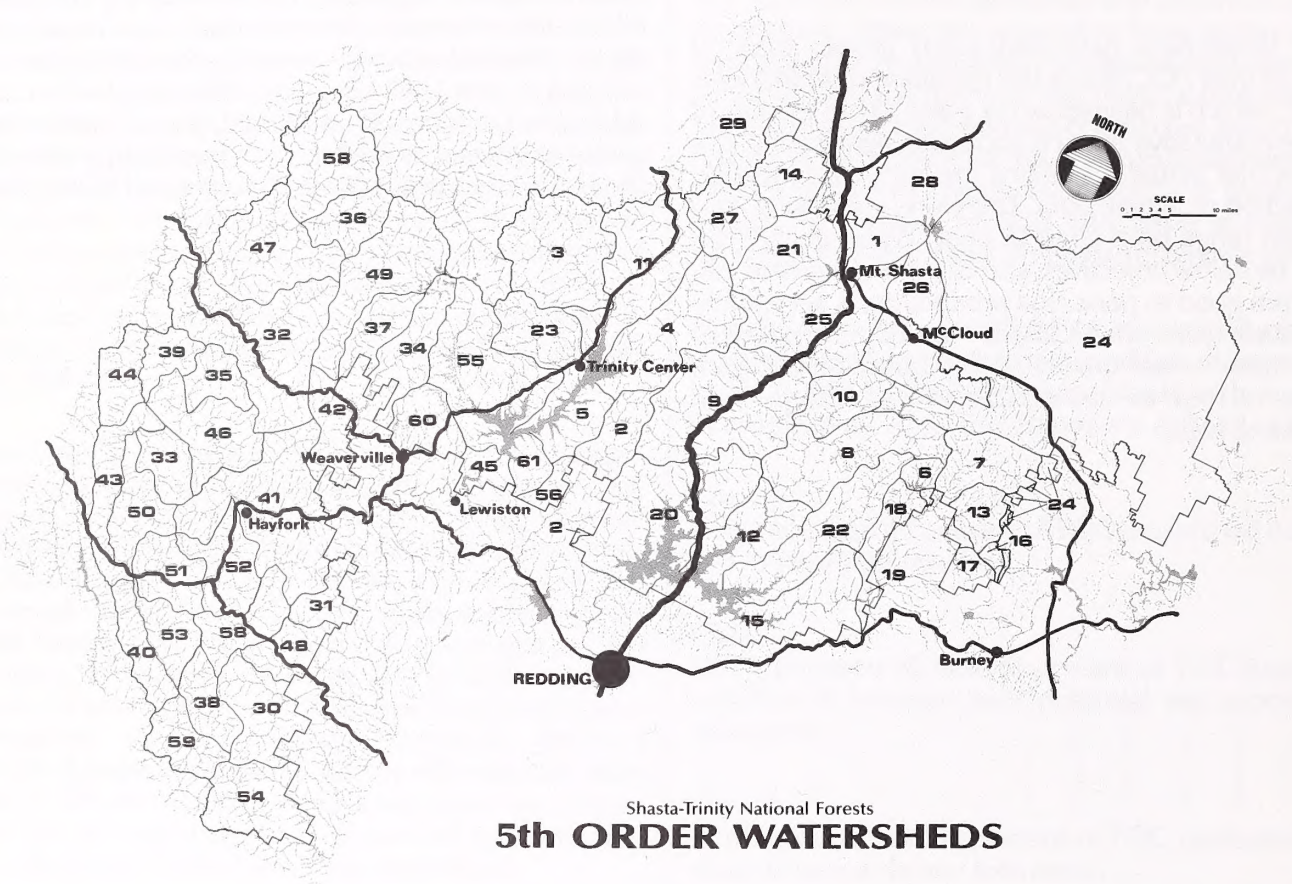
quality or soil productivity due to the initiation of cumulative watershed effects.

On Class 2 watersheds stream channel conditions generally range from fair to good, while water quality generally meets objectives. Soil productivity is maintained, although at lower levels than Class 1 watersheds. Within subwatersheds, there is a low to moderate potential for increased erosion and accompanying decreased site productivity and water quality due to cumulative effects.

Class 3 watersheds have ERA levels greater than 80 percent of their TOC. Since this condition class straddles the TOC, which is defined as the point where the risk of initiating cumulative impacts increases significantly, it is apparent that actual conditions can vary tremendously as a function of actual ERAs. Therefore, watershed condition can range from good to poor. Water quality can meet or be below objectives, and channel conditions can range from good to poor. Soil productivity is acceptable but at levels lower than Classes 1 and 2. The potential for decreased water quality and soil productivity from erosion, related to cumulative effects, range from moderate to high.

Sixty-one watersheds have been identified within the Forests (refer to map, **Figure H-1**). These watersheds range from 11 to 410 square miles in size. An inventory of the existing watershed condition of these watersheds indicates that most are presently Class 1 and Class 2 (**Tables H-1** and **H-2**). However, five watersheds have relatively high disturbance levels which cause them to be Class 3. These watersheds are the East Fork of the South Fork Trinity River, Rattlesnake Creek, Gulch, Hyampom and Upper Hayfork Creek. Cumulative effects have occurred within subwatersheds of these watersheds, and there remains a significant risk of initiating cumulative effects within the main channels which drain these watersheds. In addition, some watersheds were extensively affected by the 1987 fires, and although they are considered to be in condition Class 2, they could undergo cumulative watershed effects in some of their subwatersheds. These watersheds are Plummer and Butter Creek.

FIGURE H-1
5TH ORDER WATERSHEDS



Shasta-Trinity National Forests

5th ORDER WATERSHEDS

Watershed boundaries are only approximate of this scale.

Table H-1
Shasta Forest
Watershed Summary

#	Watershed Name	Watershed Area* (Acres)	Threshold of Concern (%ERA)	Existing ERA (%ERA)	Watershed Condition (Class)
1	Coffee Creek	59,334	16%	1.5%	1
2	Swift Creek	35,790	16%	6.2%	1
3	East Trinity Reservoir	23,860	18%	6.6%	1
4	Clear Creek	20,334	16%	1.0%	1
5	Main Fork Trinity River	47,222	16%	5.0%	1
6	East Fork Trinity River	40,434	16%	6.2%	1
7	Upper Trinity River	19,864	16%	5.1%	1
8	Willow Creek	4,555	14%	4.0%	1
9	Parks Creek	20,406	16%	8.0%	2
10	South Fork Sacramento	40,139	16%	10.0%	2
11	Upper Sacramento River	28,855	16%	8.0%	2
12	Sacramento Arm	68,998	16%	1.0%	1
13	Lower Sacramento River	54,950	16%	6.0%	1
14	Whitney Creek	40,760	18%	4.0%	1
15	Avalanche Creek	15,810	18%	6.0%	1
16	Upper Squaw Valley Creek	18,110	16%	8.0%	2
17	Lower Squaw Valley Creek	22,215	16%	7.0%	2
18	Lower McCloud River	44,372	16%	1.0%	1
19	McCloud Arm	31,383	16%	1.0%	1
20	Upper McCloud River	263,934	18%	10.0%	2
21	Kosk Creek	11,812	14%	7.0%	2
22	Pit #4	6,996	16%	6.0%	1
23	Pit #5	11,930	14%	6.0%	2
24	Nelson Creek	7,464	14%	5.0%	1
25	Iron Canyon	7,757	14%	6.0%	2
26	Pit #6	9,520	14%	4.0%	1
27	Squaw Creek	46,074	14%	3.0%	1
28	Pit Arm	48,485	14%	2.0%	1
29	Pit #7	7,640	14%	4.0%	1
	Shasta Forest Total	**1,059,003**			

* Watershed area includes only National Forest Lands

Table H-2
Trinity Forest Watershed Summary

#	Watershed Name	Watershed Area* (Acres)	Threshold of Concern (%ERA)	Existing ERA (%ERA)	Watershed Condition (Class)
30	Upper New River	56,536	14%	1.0%	1
31	East Fork New River	26,152	16%	1.4%	1
32	North Fork Trinity River	67,056	16%	0.5%	1
33	East Fork North Fork Trinity River	23,919	16%	1.2%	1
34	Canyon Creek	32,617	14%	1.2%	1
35	Weaverville	22,156	16%	6.3%	1
36	West Trinity Reservoir	15,104	16%	10.6%	2
37	Upper Clear Creek	4,642	16%	3.0%	1
38	Lewiston	11,930	16%	4.6%	1
39	Stuart Fork	66,997	16%	7.0%	2
40	Lower New River	65,822	14%	2.5%	1
41	Burnt Ranch	102,906	14%	3.5%	1
42	Helena	21,569	16%	5.2%	1
43	Hyampom	12,833	12%	10.5%	3
44	Corral Creek	18,923	16%	9.8%	2
45	Lower Hayfork Creek	47,192	16%	3.8%	1
46	Hayfork Creek	71,816	18%	6.0%	1
47	Browns Creek	15,457	18%	6.0%	1
48	Butter Creek	22,039	16%	10.0%	2
49	Plummer Creek	26,840	16%	7.8%	2
50	Salt Creek	30,149	16%	6.8%	2
51	Rattlesnake Creek	27,974	16%	15.8%	3
52	Upper Hayfork Creek	28,679	16%	12.9%	3
53	Middle Fork Cottonwood Creek	17,572	18%	8.0%	2
54	Smoky Creek	21,834	16%	8.2%	2
55	Beegum Creek	42,020	16%	7.2%	2
56	East Fork South Fork Trinity	23,864	14%	11.3%	3
57	Upper South Fork Trinity	26,741	14%	10.6%	2
58	South Fork Cottonwood Creek	45,557	16%	1.3%	1
59	Happy Camp Creek	23,120	12%	8.0%	2
60	Hidden Valley Watershed	27,688	12%	8.2%	2
61	Gulch Watershed	14,840	14%	10.0%	3
	Trinity Forest Total	**1,062,544**			
	Combined Shasta-Trinity Total	**2,121,547**			

* Watershed area includes only National Forest Land.

APPENDIX I

The Regional Timber Supply-Demand Situation in California

APPENDIX I
The Regional Timber Supply-Demand Situation in California

This appendix was created to address public comments that requested additional information on the timber supply and demand situation in relation to supplies from individual National Forests. Existing information from recent assessments, University of California research, Forest Service research, and the State of California's Forest and Rangeland Resources Assessment Program was used for this purpose.

Historical Harvests from Public and Private Lands - Statewide

Timber harvest in California has been in a downward trend for over 30 years. In 1955, record timber harvests in the State, from all lands, totaled 6 billion board feet (BBF). In that year, harvest from private lands was 4.9 BBF and harvest from the National Forests was 1.0 BBF. Less than 100 million board feet (MMBF) were harvested from other public lands. Since that time, total harvest in the State has trended downward, with shorter term fluctuations associated with the business cycle.

As shown in **Table I-1**, harvest levels fluctuate widely from year to year rather than following a smooth pattern. Year to year variations are influenced primarily by changes in housing markets and general business conditions. Only over the long term do timber inventory and growth levels limit harvests.

Statewide Demand for Timber Products and the Relationship to Harvest Levels

With a population that has reached 30 million people and a high level of income per capita, California is one of the largest markets for lumber, wood, and paper products in the world. When discussing the relationship between the demand for timber products (lumber, wood, and paper) and the demand for timber harvest (stumpage), it is necessary to translate the demand for timber products into its timber harvest equivalent. Expressed in these terms, the demand for timber has been increasing at a rate about equal to the population growth rate. Per capita consumption of lumber has declined while per capita consumption of paper and reconstituted wood products has increased over the past 40 years. As the population in the State grew from 10.6 million in 1950 to 30 million today, the demand for timber increased from 4 BBF annually in 1950 to about 12 BBF annually now.

While the demand for timber has been increasing, timber harvests in the State have been decreasing. The difference between the growing demand and the declining supply has been made up by increased imports to the State - primarily from Oregon, Washington, and Canada. California has changed from a net exporter to a net importer of timber products over the last three decades.

California now relies on imports for more than 60 percent of its overall timber product needs. Although California receives only a small proportion of its imports from Canada, Canadian shipments to the U.S. have a significant effect on the State's ability to import timber products from the Pacific Northwest. In contrast to California's reliance on imports, the bulk of the timber products produced in Washington and Oregon are exported to other States and countries. Increases in Canadian shipments to the eastern half of the U.S. have displaced timber products from the Pacific Northwest. The result has been an increase in the availability of timber products from the Pacific Northwest for California markets. Increased production in the South has also been displacing the Pacific Northwest in eastern markets. This has also increased the availability of products from the Northwest in California markets.

Broad Level Socio-economic Effects

About 95 percent of California's population lives in urban areas. As consumers, the primary effect on them is a change in prices paid for timber products. A reduction in timber harvests in the State reduces competition among suppliers, raises market prices, and leads to increased use of imported products. Econometric analysis done by the Pacific Northwest Forest and Range Experiment Station in 1990 indicates that a one BBF change in harvest level would change lumber prices by about four percent. This translates into a $250 change in the price of the typical new house at current conversion efficiencies. For the U.S. economy as a whole, this would amount to a cost to home buyers of about $400 million annually. The high level of competition in the market for timber products means that individual National Forests or individual private timber owners cannot significantly affect consumer prices. However, National Forests or private timber owners, in aggregate, can significantly affect consumer prices.

Another effect on the urban population is through "indirect and induced" employment. While the employment effect of changes in harvest levels is felt most strongly in the communities where the logging and sawmilling takes place, some broader level employment effects also occur. This is because most firms that manufacture and

Table I - 1
California Timber Harvests by Ownership
1952 - 1991

Year	Private	Other Public	National Forest	Total
	- billion board feet -			
1952	4.40	.05	.61	5.06
1953	5.32	.04	.63	5.99
1954	4.79	.05	.76	5.60
1955	4.93	.06	1.03	6.02
1956	4.69	.08	1.09	5.86
1957	4.36	.07	.92	5.35
1958	4.47	.09	1.11	5.67
1959	4.29	.12	1.48	5.89
1960	3.70	.11	1.33	5.14
1961	3.85	.11	1.38	5.34
1962	4.05	.11	1.38	5.54
1963	3.69	.11	1.66	5.46
1964	3.50	.11	1.86	5.47
1965	3.21	.14	1.92	5.27
1966	2.97	.11	1.93	5.01
1967	3.06	.11	1.89	5.06
1968	2.82	.16	2.36	5.34
1969	2.88	.12	2.00	5.00
1970	2.62	.10	1.84	4.57
1971	2.59	.13	2.06	4.78
1972	2.66	.12	2.22	5.00
1973	2.81	.10	2.01	4.92
1974	2.86	.11	1.73	4.70
1975	2.71	.10	1.52	4.33
1976	2.76	.08	1.89	4.73
1977	2.96	.09	1.74	4.79
1978	2.78	.08	1.80	4.66
1979	2.26	.09	1.73	4.08
1980	1.86	.07	1.51	3.44
1981	1.72	.04	1.09	2.86
1982	1.50	.06	.94	2.50
1983	1.89	.08	1.68	3.65
1984	2.09	.03	1.56	3.68
1985	2.17	.06	1.82	4.05
1986	2.31	.09	1.96	4.36
1987	2.58	.10	1.97	4.65
1988	2.60	.06	2.18	4.84
1989	2.64	.06	2.02	4.72
1990	2.67	.05	1.53	4.25
1991			1.30	

Sources: California Department of Forestry and Fire Protection
California State Board of Equilization
Bureau of Indian Affairs, USDI
Bureau of Land Management, USDI
Forest Service, USDA

supply goods and services to logging and sawmill companies are typically located in the major urban centers rather than in the rural areas where the logging and milling takes place.

Logging and milling by itself typically requires 4-7 person years of employment per million board feet processed. Newer, more specialized and automated mills using readily accessible timber are at the bottom of this range, while more labor intensive operations are at the top of this range. This direct employment generates indirect employment in firms that supply goods and services to logging and milling firms and induced employment in firms and governments providing goods and services to those employed directly and indirectly. In undeveloped rural areas there is little if any indirect and induced effect because suppliers are located outside of the area and logging and sawmilling employees must "drive into the city" to make major purchases. In addition, on most National Forests a portion of the logs harvested are trucked well outside of the primary zone of influence for manufacturing into lumber products. As a result, total statewide employment effects of changes in harvest levels are larger than employment effects occurring in the primary zones of influence for individual National Forests. Employment effects on a statewide basis range between 10 and 20 person years per million board feet of timber harvested. These employment effect estimates were made with input-output models constructed by the Forest Service and the U.S. Departmant of Commerce. They reflect present technologies. As the trend toward increased timber utilization efficiency continues, employment generated per unit of timber processed is expected to decline.

The Outlook for Timber Supplies - Private Lands

According to projections completed by the University of California in July 1990, timber supplies from private lands in California can be maintained at over 2.2 BBF annually over the 10-15 year life of the Forest Plans. An alternative projection, prepared by the California Department of Forestry and Fire Protection in 1988, projected private timber harvests at 1.96 BBF annually during the life of the Forest Plans. The primary difference between the two projections is the projected response of nonindustrial private owners to higher market demand for their timber. Timber harvests from this ownership are well below the level that can be supported by available timber inventories and growth.

Both projections indicate reduced timber supplies from industrial timberland ownerships and increased supplies from nonindustrial timberland ownerships during the life of the Forest Plans. The primary reason for this shift is that harvest levels on industrial ownerships have been at a higher rate than can be sustained by existing timber inventories and growth. By contrast, nonindustrial ownership harvests have been well below the level that can be sustained by the timber inventory and growth on these ownerships. Both projections consider the fact that many of the smaller nonindustrial owners do not consider timber harvesting, and the income derived from it, to be a management objective. Neither of the two projections account for harvest restrictions that may be imposed on private harvests as a result of the listing of the northern spotted owl as threatened or changing State regulatory policies. Large reductions in harvesting as a result of increased regulation of private timberlands are possible, but reliable projections are not currently available.

Outlook for Timber Supplies - Imports

Table I - 2
Projected Timber Harvest, Growth, and Inventory on Private Land in the Four Major Timber Supply Regions of California

Area	Average Annual Harvest, MMBF 1995-2005	Net Annual Sawtimber Growth MMBF, 1995-2005	Sawtimber Inventory BBF, 1995-2005
North Coast	1,100	1,080	39.4
Northern Interior	542	503	18.0
Sacramento	467	413	19.7
San Joaquin	145	148	6.4
All Private Land	2,254	2,144	83.5
Industrial Private	1,760	1,169	41.5
Non-industrial Private	496	974	42.1

Source: Krumland, Bruce, and William McKillop, Prospects for Supply of Private Timber in California, University of California, July 1990.

As discussed above, the Pacific Northwest is the primary source of imported timber products in California. Through displacement effects in national markets, Canada and the South also play a major role in determining the supply of timber products from the Northwest that is available to California markets.

According to studies conducted by Forest Service research units, timber supplies from the South are likely to increase, but at a slower rate than experienced over the last 20 years, during the life of the Forest Plans. A decline or fall down in supplies from the South is in prospect for the next century without an increase in investment and timber growth.

Studies conducted in Canada indicate that sawtimber growth and inventory is not expected to restrain exports to the U.S. until after the turn of the century. However, recent tariff and trade negotiations are expected to moderate Canadian exports to the U.S. over the near term.

A decline in timber harvests in the Pacific Northwest is expected over the next 10-15 years. This is due to reduced availability of timber inventories on both public and private lands.

Siberia contains the largest undeveloped softwood timber resource in the world. Recent negotiations indicate that significant supplies of logs and manufactured wood products are likely to be imported once concerns about pest control are resolved.

The overall outlook is that imports will continue to grow to support increased demands by California consumers over the next 10-15 years. However, imports will likely increase at a lower rate than over the last 20 years and may decrease in availability beyond the year 2000.

The Outlook for Timber Supplies - National Forests

The allowable sale quantities (ASQ) from individual Forest Plans are indicators of future timber supply levels from the National Forests in California. The ASQ places an upper limit on the average annual amount of green sawtimber from suitable timberlands that can be sold from a National Forest in the first ten year period of the Plan. Nonchargeable timber (dead timber and fuelwood from either suitable or unsuitable timberlands) is in addition to the ASQ. The addition of nonchargeable volume usually increases the total amount sold by a few percentage points.

The amount of timber offered for sale is determined through the budget process. When the amount of timber sold in any given year is less than the ASQ, sales in future years may be higher than the ASQ, since the ASQ is a limit on the average annual amount that can be sold over a ten year period.

Over the long term, the volume harvested equals the volume sold. However, over shorter periods the volume harvested can exceed (or fall short of) the volume sold by causing the uncut volume under contract to decline (or increase).

In the early 1980's the volume harvested was less than the volume sold, and in the late 1980's volume harvested exceeded the volume sold.

Timber sales projected under the individual National Forest Plans in Region 5 total less than 1.2 BBF annually. This projection is based on the ASQ from completed Forest Plans and projections from information that is currently available for the Plans that have yet to be finalized. These projections assume implementation of current direction concerning management of the northern spotted owl. These projections are subject to change as a result of new information that may become available concerning the northern or California spotted owl and other issues that may lead to Plan adjustments.

The timber sale volume projected under the Forest Plans is below the average annual volume sold in recent years. Output under the Plans is also below the 1990 RPA sale offering goal of 1.49 BBF for the period 1995-2000. The 1990 RPA goal was based on information developed prior to the publication of the Interagency Scientific Committee's Conservation Strategy for the Northern Spotted Owl and its listing as a threatened species by the U.S. Fish and Wildlife Service.

The Subregional Outlook

Based on the historical pattern of log flows to mills, the State can be divided into four major timber market areas: North Coast, Northern Interior, Sacramento, and San Joaquin. The Central Coast and Southern California areas are minor producing areas (see **Tables I-2 and 3**).

Virtually all of the decline in the State's timber harvest that has occurred over the last 30 years has taken place in the North Coast market area on private lands. The outlook now is for relatively stable output from private lands over the 10-15 year life of the Forest Plans in all major market areas.

The relative contribution of National Forests to the timber supply differs markedly between market areas. In the North Coast area where the private timber supply has fallen most rapidly, National Forests supply about 10 percent of the timber. In the Northern Interior and Sacramento areas, National Forests supply roughly one half of the timber. In the San Joaquin area they supply roughly two thirds of the timber.

Timber outputs under the Forest Plans are projected to be lower than average annual sale levels in recent years. Adverse impacts on local economies resulting from implementation of the Plans are projected in all major producing areas. Since sawmill capacity already exceeds available timber supplies in all major producing areas, mill closures are expected to continue in all areas of the State during the life of the Forest Plans.

Shasta-Trinity National Forest Outlook for Timber Supply/Demand

The Shasta-Trinity National Forests have traditionally been among the major timber producing Forests in California. Many local communities are highly dependent on the timber supply from the Forests.

The annual capacity of the mills in the local area is estimated at over 750 MMBF (See **Table I-4**). National Forests supply about one-half of the timber for these mills, while the Shasta-Trinity Forests supply about one-fourth of the timber.

Over 60 percent of the total mill capacity exists in the larger communities of Anderson, Redding and Central Valley. These mills obtain about 45 percent of their timber from National Forest lands, 15 percent of which comes from the Shasta-Trinity Forests. This is in contrast

Table I - 3
Recent Average Annual National Forest Timber Sales Compared to Allowable Sale Quantities in Forest Plans

Timber Supply Area	National Forest	1989-91 Average Volume Sold, MMBF	Forest Plan Allowable Sale Quantity MMBF *	
North Coast	Six Rivers	130	65	PF
Northern Interior	Klamath (1)	103	82	PF
	Modoc	46	46	F
	Lassen	147	96	F
	Shasta-Trinity	121	70	PF
Sacramento	Mendocino (2)	30	21	PF
	Plumas (3)	138	266	F
	Tahoe	91	129	F
	Eldorado (4)	154	137	F
San Joaquin	Stanislaus (5)	103	88	F
	Sierra	97	88	F
	Sequoia	63	75	FS
	Inyo (6)	9	7	F
	San Bernardino	4	5	F
	R5 Total	**1,236**	**1,175**	

(1) Typically about one half of the logs from the Klamath National Forest flow into Oregon. Most of the remainder are milled in the Northern Interior area.

(2) Mendocino logs typically flow 30 percent to the Sacramento area, 30 percent to the Northern Interior area, and 40 percent to the North Coast.

(3) Plumas logs typically flow 40 percent to the Northern Interior area and 60 percent to the Sacrmento area.

(4) Eldorado logs typically flow 60 percent to the Sacramento area and 40 percent to the San Joaquin area.

(5) Stanislaus logs typically flow 20 percent to the Sacramento area and 80 percent to the San Joaquin area.

(6) Inyo logs typically flow 50 percent to the San Joaquin area and 50 percent to the Northern Interior area.

* Plan status is indicated as follows:
F Final Plan value
PF Projected Final Plan value. Preliminary and subject to change.
FS Final Plan value as projected to be amended per settlement agreement.

Table I-4
Timber Processed from National Forest Land
(average annual/million board feet)
5

County/Community	Mill Capacity	Shasta-Trinity National Forests' Land	Other National Forest Land	Total National Forest Land
Shasta				
Anderson	334	49	82	131
Burney	115	15	33	48
Central Valley	65	17	13	30
Redding	60	5	43	48
Total	574	86	171	257
Siskiyou				
McCloud	20	5	10	15
Mt. Shasta	0	0	0	0
Weed	67	7	8	15
Total	87	12	18	30
Trinity				
Hayfork	65	32	0	32
Weaverville	40	22	0	22
Total	105	54	0	54
Other	-	13	0	13
Total	**766**	**165**	**189**	**354**

Source: Based on mill survey completed in 1991 by the Shasta-Trinity National Forests.

to the smaller communities of Hayfork, Weaverville, Weed and McCloud. These areas have about 25 percent of the total mill capacity, and also obtain 45 percent of their timber from National Forest lands, all of which comes from the Shasta-Trinity Forests.

The mills in the smaller communities are, therefore, more dependent on timber from the Shasta-Trinity Forests than the larger communities. They will be significantly affected by the timber harvest level.

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APPENDIX J

Major Silvicultural Systems and their Application

APPENDIX J
Major Silvicultural Systems and their Application

A Introduction

The purpose of this appendix is to describe the major silvicultural systems used in land management planning for the Shasta-Trinity National Forests, and the advantages and disadvantages of each, considering both biological and managerial perspectives. However, almost all of the information in this appendix also applies to selecting an appropriate silvicultural system for a particular stand.

Silvicultural systems are used to manage forest stands. A **silvicultural system** is a planned sequence of treatments for controlling the species composition and structure of the vegetation during the life of a stand. A **stand** is a community of trees sufficiently uniform to be distinguishable as a silvicultural or management unit. Typically, stand sizes vary from about 5 to over 30 acres on National Forest lands.

Management objectives for stands typically are **combinations** of forest products and amenities. An example is: specific amounts of livestock forage, water runoff, and wood products; kinds of wildlife habitat; and specific scenic view qualities. No single silvicultural system can produce all desired combinations of products and amenities from a particular stand, or from a National Forest.

Forests are managed by using combinations of silvicultural systems to achieve the forest management objectives. The combinations vary greatly, depending on the characteristics of local forest ecosystems and differing management objectives.

Selection of the appropriate silvicultural systems occurs at both the National Forest land management planning level and Ranger District project level. The Forests' selection is based on a broad match of silvicultural systems with the overall planning objectives and ecological characteristics of **broadly-defined land classes**. Examples of land classes are: areas capable, available and suitable for growing commercial wood products; riparian management zones; and spotted owl habitat conservation areas. At the Ranger District, project level selection of silvicultural systems is typically made by a certified silviculturist. Choices are based on matching the attributes of the silvicultural systems with specific management objectives and the ecological characteristics for specific stands.

B Descriptions of the Silvicultural Systems

A silvicultural system typically includes cutting trees, growing new trees, and controlling competing plants. Cuttings are classified as **regeneration cuttings** (those that help to replace stands), and **intermediate cuttings** (those that maintain or improve the character of existing stands).

Silvicultural systems are not just the creation of professional foresters; rather, they are adaptations of natural occurrences. Nature makes "regeneration cuttings" by means of fire, insects, disease, wind, and other phenomena; by removing a single tree, a small group of trees, a stand, or sometimes an entire forest.

Regeneration cuttings strongly influence stand characteristics and management options. Therefore, the five major silvicultural systems are named after them: **clearcutting, seed-tree, shelterwood, single-tree selection,** and **group selection**. Each of these systems includes regeneration cuttings to establish new tree seedlings or sprouts, and intermediate cuttings to develop the desired stand characteristics, such as species composition, spatial distribution, and plant vigor.

The clearcutting, seed-tree, and shelterwood systems are **even-aged systems**. This means that all of the trees in the stand are approximately the same age. The single-tree and group selection systems are **uneven-aged** systems; the trees in the stand differ markedly in age, with at least three major age classes present. Uneven-aged stands have no beginning or end points in time.

Even-aged Systems

Clearcutting is the harvesting, in one operation, of all merchantable trees in a stand or a larger area to help establish a new even-aged stand. The new stand may be created by natural processes, such as seeding from trees in adjacent stands, or by sprouting from the stumps or roots of the cut trees. The new stand can also be created by man through broadcast scattering of seeds, or by planting seeds or seedlings. On the Shasta-Trinity National Forests, clearcut stands are usually regenerated by planting seedlings.

Clearcutting does not necessarily mean that all unmerchantable trees are removed. Where feasible, high-quality unmerchantable trees are saved to become part of the new stand. It is estimated that high-quality unmerchantable trees, in logical treatment units, can be retained on about 10-20 percent of the acres to be regenerated by clearcutting on the Forests, particularly on gentle terrain.

The clearcutting silvicultural system is illustrated in **Figure J-1**.

The **seed-tree** system (shown in **Figure J-2**) requires leaving a few good seed-producing trees per acre (typically about 3 to 10) during the regeneration cutting. These trees produce the seed needed to establish a new even-aged stand. Following seedling establishment, the seed trees are harvested. This system has seldom been used for intensive timber management on the Forests. The primary reasons are: frequent unreliability of natural regeneration in the desired periods, invasion of cleared lands by unwanted vegetation (particularly shrubs), and the poor economics of harvesting the few seed trees after natural seedlings were established.

The **shelterwood** system (shown in **Figure J-3**) requires leaving sufficient trees per acre (typically 10 to 20), during the regeneration cutting, to provide an environment that protects (shelters) the seedlings of a new even-aged stand. This is referred to as the "seed step". Protection may be needed from excessive moisture stress or frosts in some forest areas. The new stand can be created by the natural or artificial processes described above.

Regeneration by planting seedlings under shelterwoods is a common practice on the Forests. The shelterwood trees are normally harvested following establishment of the seedlings of the new even-aged stand. Removal of the shelterwood trees is called the "overstory removal" step. The shelterwood system is most commonly used in stands where red or white fir are to be regenerated.

Seed and shelter trees left after a seed tree or shelterwood seed step cut may be retained through the life of the newly regenerated stands. When this occurs, these cuts are commonly referred to as **green tree retention**. This is most commonly done to meet ecological needs such as for wildlife habitat.

Uneven-aged Systems

In the **single-tree selection** system (shown in **Figure J-4**), each tree is evaluated for its contribution to the desired characteristics of the uneven-aged stand. Regeneration and intermediate cuttings are usually done in one operation. The desired seedlings or sprouts grow in the spaces created by harvesting of individual trees.

Repeated selection cuttings, part of the single-tree selection system, have been used frequently to manage National Forest lands, particularly in the Sierra Nevada and Cascade Mountain Ranges. There has been a major shift to using the clearcutting or shelterwood systems over the last two decades. The primary reason is that the selection cuttings caused significant understocking in many stands, thereby reducing productivity. There are many examples of poor selection cuttings in California, under the guise of the single-tree selection system. High quality, large trees were cut, leaving inferior, small trees. Genetic principles were ignored, and many stands were left understocked, with slow-growing, small trees that are more susceptible to attacks by insects and diseases. In these situations, establishing a new even-aged stand typically is the most efficient way of regaining desired productivity levels and other stand qualities.

The **group selection** system requires harvesting trees in small groups (usually less than two acres). The openings created in the stand resemble miniature clearcuts. The uneven-aged stand consists of a mosaic of even-aged groups. Thus, the group selection method uses the principles of even-aged systems described above to manage much smaller units of land.

Even-aged systems are more practical than uneven-aged systems for intensive management of wood products. The reasons are explained in Section E, "Managerial Contrasts Among Forests and Stands Managed by Different Silvicultural Systems".

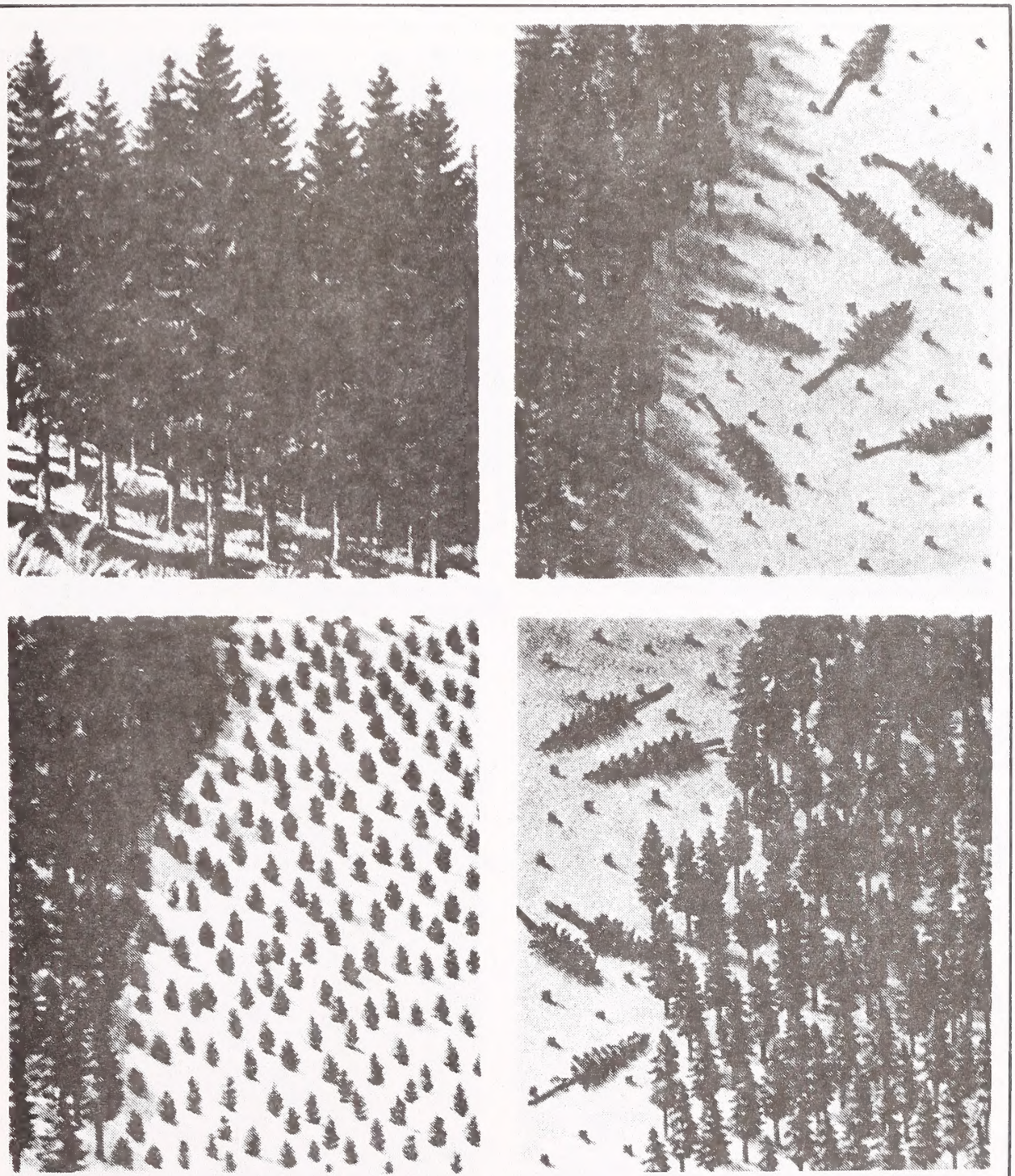
Timber Yield and Regulation of C Forests and Stands

Timber **yield** is the amount of wood that is harvested from a specified forest area. The maximum yield allowed from the Shasta-Trinity National Forests for a planning period (typically one decade), is called the **allowable sale quantity** (ASQ). By Federal law, the ASQ generally cannot exceed the long-term, sustained capacity of the Forests to grow wood. Within each National Forest, stands are managed by silvicultural systems to achieve a continuous production of the ASQ.

When this continuous production level is achieved, the forest and stands are said to be **"regulated"**. Where the single-tree selection or group selection silvicultural systems are used, each regulated stand would produce approximately the same yield from **each** harvest. This would occur about every 10 years. By contrast, where the even-aged systems are used, yields from each harvest in a regulated stand would not be equal, but the average yield for the forest would be the same.

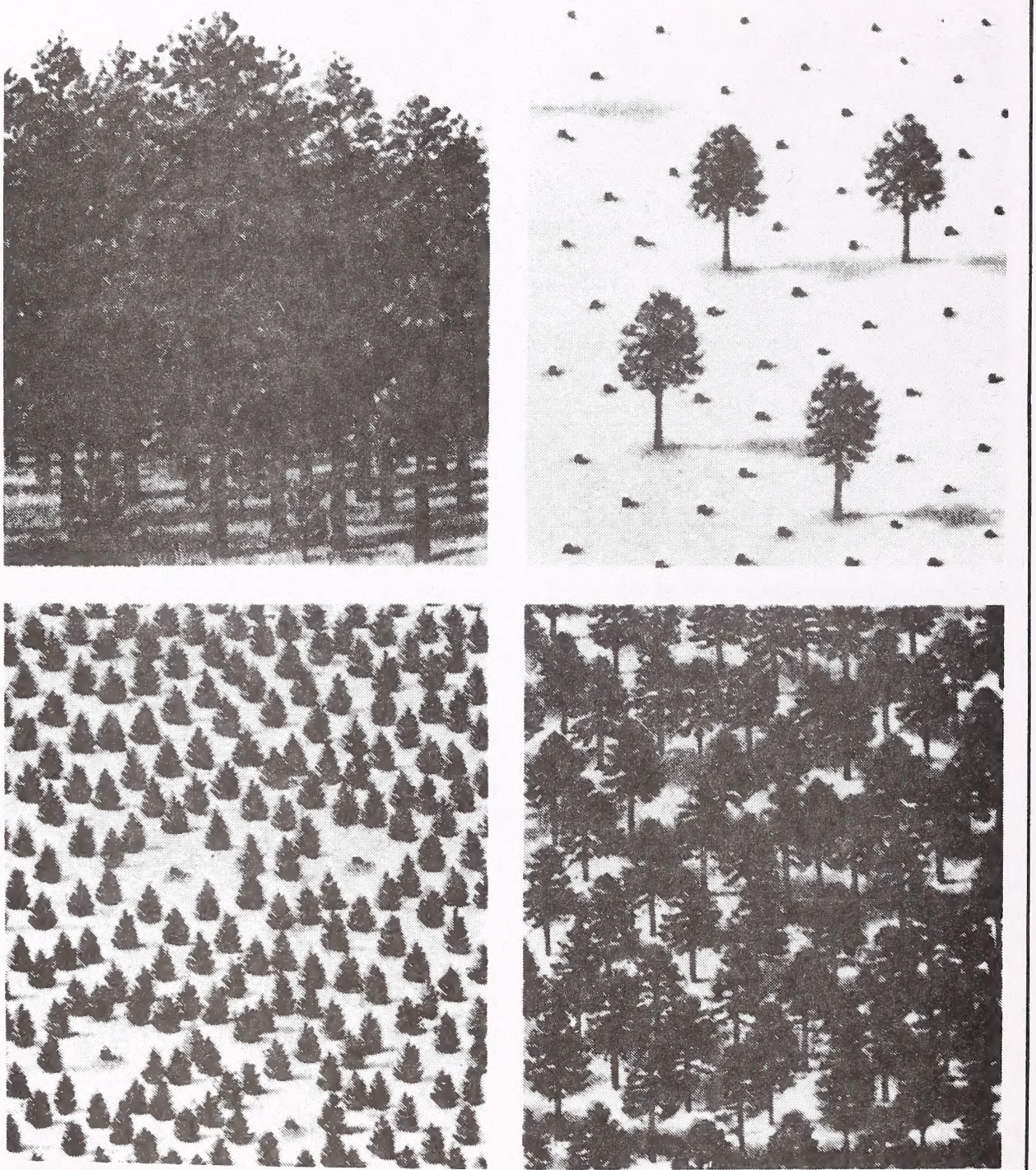
The conversion of wild stands to regulated stands has just begun. The goal of regulation will take many decades to achieve. No National Forest in California has been regulated yet.

FIGURE J-1
CLEARCUTTING SYSTEMS



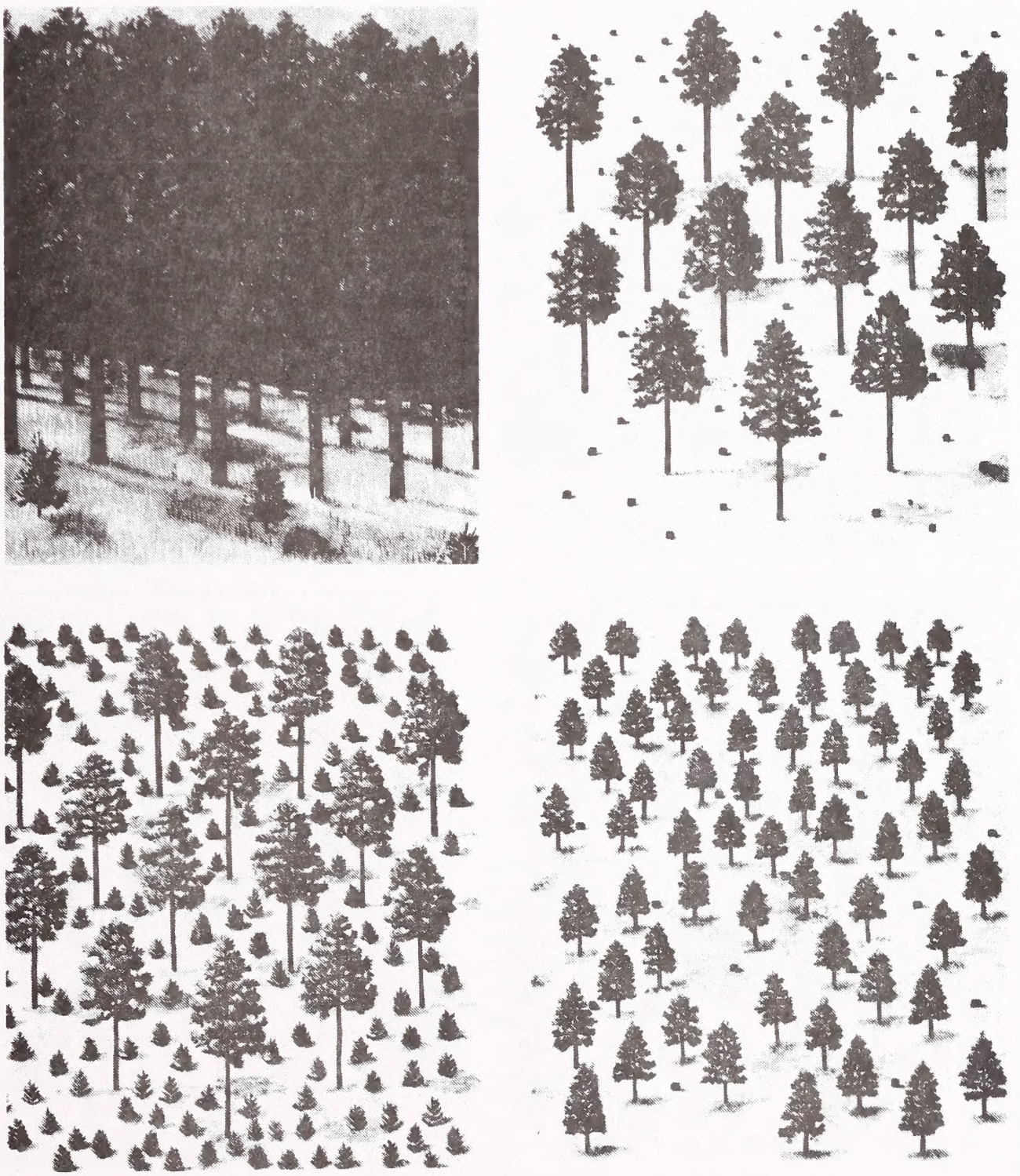
Clearcutting. *Part of a mature stand is cut, removing all trees. A new stand arises from seeds of surrounding trees or from sprouts sent up by roots or stumps. Seedlings may also be planted or seeds broadcast. When the new trees are well on their way in the unobstructed light of the clearing, a neighboring stand of mature trees is cut in turn. (The illustration is from* The Secret Life of the Forest *by Richard M. Ketchum, copyright 1970 by American Heritage Press, and is used with the permission of McGraw-Hill Book Company.)*

FIGURE J-2
SEED-TREE SYSTEM



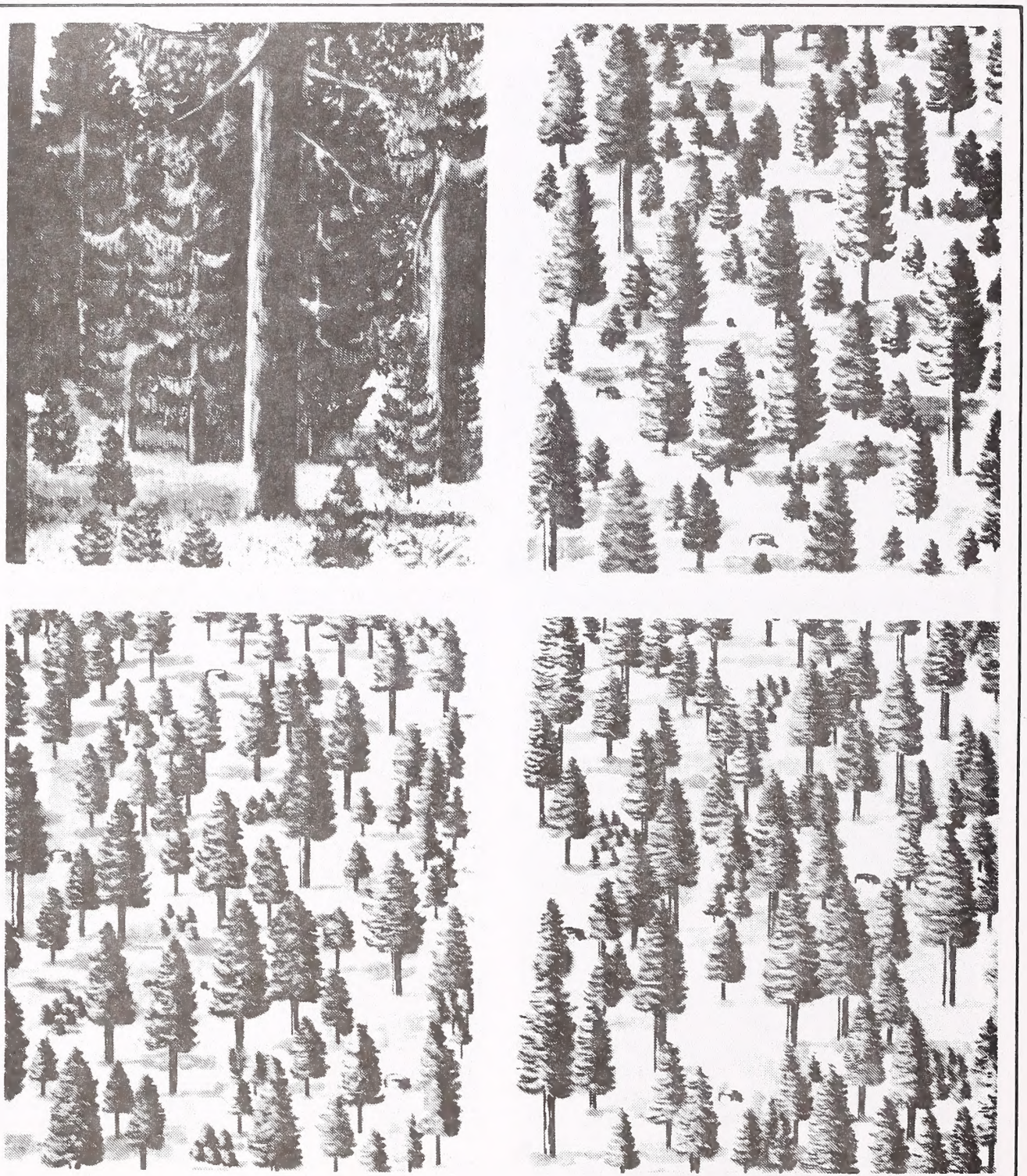
Seed-tree System. *The mature stand is logged, but enough trees are left to reseed the area. The seed trees usually are large and valuable, and may be harvested when they have fulfilled their purpose. Like clearcutting, the system favors light-demanding species. (The illustration is from* The Secret Life of the Forest *by Richard M. Ketchum, copyright 1970 by American Heritage Press, and is used with the permission of McGraw-Hill Book Company.)*

FIGURE J-3
SHELTERWOOD SYSTEM



Shelterwood System. *A mature stand is partially cut, leaving some of the better trees of desired species to grow, cast seed, and provide shade and perhaps other shelter for the new stand. Usually more trees are left per acre than in the seed-tree system. These shelter trees will be harvested after seedlings have become established and no longer need protection.*

FIGURE J-4
SINGLE-TREE SELECTION SYSTEM



Single-tree Selection System. *Cuts are made more often than in other systems, but since the entire stand is never removed, appearances are not much affected. Undesirable trees are removed, overly dense areas are thinned, and mature trees are harvested during each cut. Seedlings of shade-tolerant species develop wherever they can find room. The stand contains trees of many ages.*

D Biological Contrasts among Forests and Stands Managed by Different Silvicultural Systems

The key biological contrasts are summarized in **Table J-1**.

Appearance

-- Variation in tree age. A forest managed by even-aged silvicultural systems consists of a mosaic of even-aged stands. Every age class would be represented in a regulated forest, and each age class would be represented by approximately the same number of stands. A regulated forest managed by the group selection system would resemble forests managed by the even-aged silvicultural systems, except that the even-aged components (groups) would be much smaller and more numerous. By contrast, each stand in a regulated forest, managed by the single-tree selection system, would have trees of many ages (perhaps all ages).

The oldest (or largest) trees in any managed forest depend primarily on the management objectives, not on the silvicultural systems. In particular, the amount of large trees or old-growth to be produced or maintained depend more on the willingness to forego yields than on the kinds of silvicultural systems used to manage stands.

-- Variation in developmental stages. In the even-aged and group selection systems, all stages of forest development are present in the forest, including grasses, forbs, shrubs, tree seedlings, and larger trees. Each stage is represented by entire stands or groups. By contrast, in the single-tree selection system the areas dominated by small plants, such as grasses, forbs, or shrubs are commonly very small (for example, less than one-hundredth of an acre), but they typically occur somewhere in every stand. In a regulated forest, the total area occupied by each stage should be about the same, regardless of the silvicultural system used.

-- Occurrence of shade-tolerant and intolerant plants. Even-aged and group selection systems favor plants that can readily be established and which grow well in full sunlight (shade-intolerant plants). These include grasses, most forbs and shrubs, and many of the most valuable commercial tree species, such as ponderosa pine and Douglas-fir. The single-tree selection system favors plants that can readily be established and grow well at low light levels (shade-tolerant plants). Examples are: many ferns, few grasses, forbs, and shrubs, many non-commercial hardwood tree species, and a few commercial conifer tree species, such as white fir and incense-cedar.

However, on low-quality forest lands, where lack of soil moisture or other soil conditions cause low plant densities, shading by trees is greatly reduced. There, shade-intolerant plants will persist if the single-tree selection system is used.

-- Diversity of plant species. Species diversity depends on the biological and physical environments, how diversity is evaluated, and how the stands are managed under the different silvicultural systems.

On moderate- to high-quality lands, stands managed by the single-tree selection system shift toward shade-tolerant species. In California, many stands and forests, which were previously dominated by more valuable pine and Douglas-fir, now have large components of less valuable tanoak, madrone, or white fir due to single-tree selection. This process could reduce tree species diversity in such stands, compared with management by other silvicultural systems. The shift towards more shade-tolerant species also means that the species diversity of plants near the ground would eventually be lower in stands managed by the single-tree selection system.

The species composition of commercial tree species may be significantly increased or decreased during stand regeneration, depending on the environmental conditions, availability of natural seed, selection of species to be planted, and the success of the plantings. If artificial regeneration fails in stands with mixed species, the diversity in the naturally-regenerated stand may be reduced significantly. Potential seed trees of some species could have been harvested, or certain species (for example, white fir) could regenerate naturally under the brush that rapidly occupies newly harvested areas.

If artificial and natural regeneration fail, the species diversity of commercial trees is significantly reduced. The risk of a complete regeneration failure is least for the single-tree selection system. There is a high probability of successful natural regeneration of all species where openings are small, seed sources are present, and environmental conditions are suitable for tree seedling establishment. The risk of loss of diversity in large openings can be reduced by planting all appropriate species or by designating appropriate seed trees or shelterwood trees of mixed species.

-- Vertical diversity. The vertical diversity in stands managed by the even-aged or group selection systems can be limited. Typically there is a single dominant layer of seedlings, saplings, or larger trees. However, there is usually considerable diversity in stands with the larger trees because some trees are significantly taller and have fuller crowns than others. Full vertical diversity still occurs, but not in each stand or group. By contrast, in the single-tree selection system, the vertical diversity within each stand should be much greater. Seedlings,

saplings, and trees in larger tree classes should be seen from any point in the stand.

-- **Tree vigor.** If the stands are well managed, tree and stand vigor should be independent of silvicultural systems, with three exceptions. First, new seedlings in openings (particularly shade-tolerant species such as red fir and white fir) are heavily stressed by heat and lack of adequate water until they develop good root systems. These stresses often cause heavy mortality (especially of natural seedlings, or of low-quality or mishandled or poorly planted seedlings from nurseries). Second, seedlings in openings are more susceptible to damage or mortality from frosts, particularly at high-elevation sites. Where seedling mortality (even of high-quality or properly handled and planted nursery seedlings) is expected to be excessive, use of the single-tree selection, shelterwood, and group selection (where groups are small) systems are favored. Third, maintaining good vigor of small shade-intolerant species, such as ponderosa pine, can be very difficult in stands managed by the single-tree selection system. To promote vigor and growth of these trees, tree density may have to be reduced. This can significantly reduce timber yields.

Many stands are severely infected with certain root diseases or dwarf mistletoes. It would be very difficult and costly to maintain or improve tree vigor and productivity on these stands if the single-tree selection system were used. These root diseases and dwarf mistletoes infect other trees more easily when this system is used.

Genetic Resources

-- **Conservation of genes.** Genetic diversity is basically unaffected when natural or artificial regeneration of commercial tree species is successful. (Successful artificial regeneration means that appropriate procedures were used during seed collection to ensure a large genetic diversity in the collected seed.) However, if regeneration of a particular species were to fail repeatedly over broad areas, genetic diversity would be reduced.

-- **Quality of genes.** Where improperly applied, the single-tree selection system can lead to "high-grading", which in turn reduces genetic quality for wood production. High grading is the selective removal of the best trees (most rapidly growing, largest, and most valuable for wood), so that most regeneration comes from seed produced by the lower-quality, remaining trees.

The average genetic quality may be significantly lowered in a stand managed by the single-tree selection system because of higher rates of inbreeding. Some forest geneticists theorize that inbreeding may also increase under the shelterwood or seed-tree systems. Nearby trees of the same species are usually closely related, and they can pollinate each other. The natural seedlings can become even more inbred. By contrast, artificial regeneration or natural regeneration from edges of large openings reduces the probability of significant inbreeding. Large openings facilitate pollen movement from more distant, less closely related trees, thus promoting genetic quality.

Productivity

No scientific long-term comparisons of wood production, using the different silvicultural systems, have been made anywhere in the world. This comparison will be possible many decades from now at Blodgett Forest, a University of California research facility. Theoretically, the total biological productivity (biomass) may be greatest for stands managed by the single-tree selection system. This is because of more continuous tree cover, compared to the other systems. However, merchantable stand growth and timber yields may not be higher for the single-tree selection system. Merchantable yields are strongly influenced by managerial factors.

E Managerial Contrasts Among Forests and Stands Managed by Different Silvicultural Systems

The major managerial contrasts described in this section are summarized in **Table J-2.**

Public Concerns

In the last two decades the clearcutting system, and to a lesser extent the shelterwood and seed-tree systems, have generated controversy in the United States and Europe.

There are at least six major concerns in California:

--Clearcut areas are regarded as visually unattractive.

--The risks of significant soil erosion and loss of soil productivity are thought to be much greater for the clearcutting system.

--Regeneration of clearcut stands is thought to be unreliable.

--The risks of significant genetic losses are thought to be much greater for the clearcutting system because new stands may be monocultures.

--The use of chemical herbicides (strongly opposed by some groups and individuals) is thought to be much greater if even-aged systems are used, particularly the clearcutting system.

--Artificial regeneration, particularly of even-aged stands, is thought to be too costly.

All of these undesirable effects can occur under any silvicultural system. However, the risks of some are significantly different among certain systems. The concerns about genetic losses were addressed earlier in the sections on **Diversity of Plant Species** and **Genetic Resources**. The other five concerns are discussed in the following sections on **Effects on Scenic Quality, Risks of Adverse Effects on Watersheds and Soils, Scientific Knowledge Base, Management Experience**, and **Wood Production**.

Other managerial aspects of the silvicultural systems are also discussed in the sections below. They cover: risk of major wildfires; risk of damage by insect, disease, or wildlife pests; production of livestock forage; protection of archeological resources; administration of silvicultural projects; timber harvesting efficiency; genetic improvements in forests; and effects on fisheries and wildlife.

Effects on Scenic Quality

It is usually easier to create or maintain naturally-appearing landscapes with uneven-aged systems rather than even-aged systems. Uneven-aged systems are usually less noticeable because they create less contrast and are more flexible in design. However, long-term maintenance of natural appearing landscapes can be more difficult under the uneven-aged systems, particularly for the single-tree selection system, because the inevitable natural wildfires are more difficult to control (see the section on **Risk of Major Wildfires**).

Depending on circumstances, all silvicultural systems may achieve visual quality objectives, whether the emphasis is on wood production or natural-appearing landscapes. Regeneration cutting in some situations can meet retention or partial retention objectives; for example, partial cuttings, such as shelterwood or single-tree selection, or openings that emulate and blend with natural conditions. Which alternatives are optimal, or even feasible, depend on factors such as location relative to the viewer, slope steepness, and available topographic or vegetative screening.

Risks of Adverse Effects on Watersheds and Soils

These risks depend more on the characteristics of the watershed and soils, and on the care and quality of work, than on the kind of silvicultural system used. Adverse effects associated with any silvicultural treatment can usually be avoided or mitigated. The major possible adverse effects are erosion, sedimentation in waterways, soil compaction, and loss of soil productivity through soil or nutrient loss.

The risks of significant, cumulative erosion and sedimentation effects in watersheds usually depend more on road quality and location than on silvicultural treatments.

The risk of significant erosion within stands depends on how much protective vegetation and litter cover is removed, as well as on road quality and location. This risk is generally higher for the clearcutting system than for other silvicultural systems, because more cover is removed. The risk is least for the single-tree selection system.

Extensive and frequent use of heavy machines can cause significant compaction of some soils. The risk of this occurring should not be significantly different among the silvicultural systems.

The risk of soil nutrient losses is increased where vegetation or litter is cleared or high-intensity fires occur. Again, the risk due to clearing vegetation or litter is greater for the even-aged silvicultural systems. High-intensity fires may occur in any stand if controlled fires are used improperly. However, the risk of high-intensity fires is greater for the single-tree selection system because crown wildfires are more likely (see the section on **Risk of Major Wildfires**).

Scientific Knowledge Base

There is less knowledge about the single-tree selection system than other silvicultural methods for National Forest lands in California.

-- **Biological.** Considerable research has been completed on the biological foundations for all of the silvicultural systems. Planting, natural regeneration, and genetic principles have been studied extensively for all systems. Research is more complete on early growth of young potential crop trees and control of competing plants for the even-aged and group selection systems. Similarly, stand growth model research is more complete for the even-aged and group selection systems. There are no major differences in the knowledge base about intermediate cuttings or about insect and disease pest management, among the silvicultural systems.

-- **Managerial aspects.** Research on the managerial aspects of California's Forests has focused on the even-aged and group selection systems. Only in the last decade have concerted efforts been made to research the long-term practicality of the single-tree selection system. Earlier studies were not completed because of difficulties with controlling regeneration of some desired species, controlling stocking, or sustaining the desired stand structures and merchantable yields. This resulted in strong recommendations against the single-tree selection system by many forest research scientists. New interest has been generated by demands for continuous

forest cover, maintenance of an unmanaged appearance, and an alternative to management by the even-aged systems. However, several decades of management will be required before analyses of overall effectiveness can be made.

Research in the group selection system is also underway in California. It, too, will require several decades of treatments to achieve regulated stands.

Management Experience

Timber **harvesting** has occurred in California for over 140 years. However, experience with managing forests with the goal of regulating potential yields, has been limited to the last several decades. Regulation of National Forest lands has involved only the even-aged silvicultural systems, particularly clearcutting. However, extensive experience has been gained with all of the silvicultural systems in managing certain stands.

-- **Single-tree selection.** Most of the harvesting from National Forest lands and many private timber lands in California has been selection cuttings of large trees. These cuttings were typically made with no long-term plan for managing the stands by the single-tree selection system. This system can require cutting trees in all size classes during each operation. Regeneration from natural seeding was usually counted on. Also, growth of the young trees and the uncut smaller merchantable trees was counted on to offset the reduction in the forest inventory due to harvesting the largest trees. Unfortunately, repeated harvests of the largest trees have often caused undesirable results: understocked residual stands with lower quality, lower value trees. These stands will have to be regenerated using one of the even-aged silvicultural systems or the group selection system, so as to re-establish full stocking levels of desired species.

-- **Group selection.** The group selection system was tried extensively on National Forest land in the Pacific Southwest Region about 20 years ago. Small openings were made to encourage natural regeneration, particularly of sugar and ponderosa pines. Special cutting guidelines were developed for different kinds of naturally-occurring groups of trees. The system, called Unit Area Control, failed for three reasons. First, the many small groups of natural regeneration could not be managed efficiently. They could not be monitored. The necessary subsequent treatments were not made. The young trees did not grow well or died. Some groups could not be treated due to the higher costs of treating small areas. Second, the cutting guidelines could not be used consistently. There was great difficulty in determining which kinds of groups were actually present in the stand and the location of their boundaries. Third, many of the small groups were unavoidably destroyed when large trees in adjacent groups were felled or when logs were moved out of the stand in later harvesting projects. It is difficult and costly to save small groups of trees on steep slopes from excessive damage during harvesting or site preparation.

-- **Even-aged systems.** The oldest plantations on National Forest lands in the Pacific Southwest Region are about 60 years old. Some are to be harvested soon and replanted, thus completing the cycle of an even-aged silvicultural system. Extensive experience has been gained in the promotion of young tree growth, intermediate cutting, and regeneration cutting treatments for even-aged systems in all major timber types in the Region. Overall, artificial regeneration following clearcutting has been very reliable in ponderosa pine, Douglas-fir, and mixed conifer stands. Artificial regeneration has been significantly less reliable in red or white fir stands. The primary causes of planting failures are: (1) difficulties with consistently producing high-quality seedlings in the nurseries, and (2) planting when the environmental conditions are inappropriate. The shelterwood system, with natural or artificial regeneration, is presently used in red or white fir stands where regeneration after clearcutting is expected to be unreliable.

Wood Production

-- **Need for the control of competing vegetation (including the use of herbicides).** Control of competing vegetation is needed in all of the silvicultural systems to ensure establishment and good growth of tree seedlings or sprouts. Some have theorized that less control is needed in the single-tree selection system. Under this system tree cover is more continuous, resulting in fewer competing grasses, forbs, and shrubs. However, these competitors cause significant moisture stress in the seedling and sapling potential crop trees (in addition to the substantial moisture stress caused by the larger trees), thereby reducing their survival and growth. There is no compelling theoretical basis for concluding that the need for control of competing vegetation should be reduced if the single-tree selection system were used. Certain commonly-occurring, major competing plants can retain good vigor when shaded by most conifers (such as manzanita, bear clover, tanoak, or madrone). Using the single-tree selection system would definitely not reduce the need for controlling competition from such plants.

Frequency of control treatments varies by silvicultural system. Treatments under the single-tree selection system could be needed somewhere in every stand as often as every 5 to 10 years. The average treatment frequencies in the other systems are much lower. For example, in any of the even-aged systems, up to about three treatments could be needed in the first ten years of a new stand. No additional treatments may be needed until the stand is regenerated - a period that could exceed 50 years. Thus, the average period between treatments would be greater than 20 years. Regardless of the silvicultural system used, the total acres treated (and the total pounds of herbicide

applied per acre, if herbicides were used) should be about the same over the long term.

The aerial application of herbicides (usually the most cost-effective and frequently the most controversial method of applying herbicides) could not be used in the single-tree selection system. Depending on topography and vegetation structure, it could also be impractical in the group selection system.

-- **Treatment costs.** The size of a treatment area is a major factor in determining treatment costs and managerial feasibility. Generally, costs per acre in intensively managed forests are higher when the treatment units are smaller. Therefore, the even-aged systems are the most cost efficient, and the group selection and the single-tree selection system (in that order) are the least cost-efficient.

Regeneration by clearcutting is the most cost-efficient among the even-aged systems. Shelterwood and seed tree systems are less so, in that order. The removal of shelterwood trees or seed-trees, after the seedlings are established, is a second cost not required in the clearcutting system.

In theory, the total cost of natural regeneration should be less than for artificial regeneration. The costs of seed collection, nursery operations, seedling handling, and planting are eliminated. However, these savings are often offset by increases in pre-commercial thinning costs. Natural regeneration often results in much greater densities of trees than would be planted, or are desirable. Also, unreliable seed production by many commercial tree species often delays natural regeneration. This reduces wood productivity. When natural regeneration is delayed, the sites are occupied by competing plants, the control of which can be costly. Overall, artificial regeneration insures prompt reforestation of preferred species at desirable densities. If natural regeneration is to be used, the shelterwood and seed-tree systems are usually more cost-efficient than the uneven-aged systems. The reason is the economic savings associated with larger scale treatment areas. Where artificial regeneration is to be used, the clearcutting and shelterwood systems are more cost-efficient, for the same reason.

-- **Achieving regulated forests, while maintaining Forest timber harvest levels.** Regulation can be accomplished most easily with the even-aged or group selection silvicultural systems. There are two critical disadvantages of the single-tree selection system. First, foresters lack the knowledge about trees that is needed for cutting on a stand-by-stand basis. There are tens of thousands of stands on a typical National Forest in California, with up to about 10,000 potential crop trees per stand. Currently, inventory data needed for the single-tree selection system are lacking for about two-thirds of these stands. Second, in the Mediterranean climate in California, large forest wildfires are inevitable. Reforestation after these fires creates many, new even-aged stands. It is very difficult to regulate a forest under a single-tree selection system when substantial acreages of unplanned even-aged stands occur.

-- **Planning, contracting, and record keeping.** The many small units used in the uneven-aged systems makes for ineffective and costly operation and administration. If stands in a typical Ranger District were managed by uneven-aged systems, in excess of 50,000 separate areas would have to be inventoried, planned for, treated, and monitored. Even with computers the management complexity would be excessive. Therefore, the extent to which uneven-aged management systems are used for intensive timber management are necessarily very limited.

-- **Timber harvesting.** Five important aspects of timber harvesting are strongly influenced by the choice among silvicultural systems: (1) variability in the sizes of harvested trees; (2) area to be harvested; (3) complexity of the harvesting treatments; (4) the probability of causing significant damage to trees left in the stand; and (5) the probability of causing long-term root disease problems. The first three aspects influence harvesting efficiencies, and the other two affect the vigor, tree stocking, and value of the residual stand.

There is wide size variation in trees harvested in each operation under the single-tree selection system. This reduces harvesting efficiency because logging equipment is size-dependent. However, this disadvantage could be insignificant in young-growth stands.

Harvesting in the single-tree selection system is much less efficient than for the other systems because more land must be treated in each operation to harvest the desired yield from the forest.

The complexity of harvesting treatments is also greatest in the single-tree selection system. Identifying which trees to cut, determining where they are to be felled, felling the trees in the designated areas, and removing the trees or logs out of the stand without damaging the residual trees can be very difficult and costly. In the single-tree selection system, cuttings occur as frequently as every five to ten years. In the other systems, only the intermediate cuttings are as complex. The regeneration cuttings in the other systems are more straightforward operations. Group selection and clearcutting are the most efficient.

Logging damage to trees left in the stand is typically greatest for the single-tree selection system. It is very difficult to selectively harvest trees in dense stands without damaging many residual trees, particularly on steep slopes. Damaged trees are often infected by wood-decaying fungi that can persist in the soil for long periods,

thus retaining the capacity to infect new trees. The fungi reduce the windfirmness, vigor, commercial value, and stocking of residual trees. This characteristic is a particular concern in developed recreation areas where selection systems are often applied. Stands with red or white fir have an especially high probability of being infected with wood-decaying fungi when damaged.

-- Genetic improvements in Forests. Genetic improvements to increase timber growth, improve tree form and wood quality, or increase resistance to disease and insect pests, depend primarily on planting trees with desirable genetic characteristics. Therefore, the potential for genetic improvement is greater for silvicultural systems that use artificial regeneration. The clearcutting, group selection, and shelterwood systems (if artificial regeneration is used) have the greatest potential for improving the genetic quality of forest trees. The single-tree selection system, with its natural regeneration and higher rates of inbreeding, has the least potential.

Risk of Major Wildfires

The even-aged systems (clearcutting in particular) are best for reducing the risk of major wildfires because the greater control of fuel distribution makes wildfire prevention and suppression easier and less costly. The single-tree selection system is least desirable because fires burn intensely and are more difficult to control. Openings, which can serve as fuel breaks, occur less frequently in forests or stands managed by this system. Also, the multiple tree layers create "ladders", permitting ground fires to spread into the crowns of the large trees. Crown fires are more destructive and more difficult to control than ground fires. Finally, the use of controlled fires to reduce the risks of large wildfires is most difficult and costly in the single-tree selection system.

Risk of Significant Pest Damage

Silvicultural treatments reduce risks by selecting appropriate tree species, by diversifying within and among stands, and by maintaining tree vigor. Diversification within stands is increased through use of multiple species or uneven-aged silvicultural systems. Vigor is promoted by preventing the trees and other plants from becoming too dense. Competing plants also provide habitat for animal pests such as pocket gophers and rabbits. Well managed stands in all systems reduce the risk of significant pest damage. However, there are exceptions.

Risk of significant insect or disease damage to trees increases if the trees have been wounded. Many wounds occur during silvicultural treatments. Accidental scarring of trees can be caused by felling nearby trees, or by bumping them with machines or logs moving through the forest. Risk increases with frequency of stand treatments, particularly cutting. Cutting frequency is much higher for the single-tree selection system than for others, so the risk of significant insect and disease damage is highest.

Two serious diseases, dwarf mistletoes and some root rots, can be difficult, costly and, in some cases, impossible to control under selection systems. Damage from these diseases is most easily controlled by managing the entire stand. Dwarf mistletoe plants can project seeds down on trees within about 100 feet horizontally, thereby infecting nearby susceptible species. Even-aged systems allow the manager to control damage from this pest through cutting treatments.

Many root disease fungi infect susceptible trees by root-to-root contact. Some root diseases start at harvest time and spread to other trees in the stand. Control may require killing trees in a zone around the infected area. Uneven-aged management, particularly the single-tree selection system, can perpetuate root disease "centers" and spread infection.

Generalizations about wildlife pest damage and silvicultural systems are difficult. The major potential wildlife pests in the Region include pocket gophers, deer, porcupines and rabbits. These animals feed in vegetation dominated by grasses, forbs, shrubs, or tree seedlings. Use of the even-aged or group selection systems can create large areas temporarily dominated by this kind of vegetation. This can cause higher densities of potential pests, which increase the risk of significant damage to potential crop trees. However, the actual damage levels are not increased where this occurs.

Production of Livestock Forage and Browse

Even-aged systems and the group selection system are best for livestock production. Grasses, forbs, and shrubs used by livestock occur in the greatest quantity in openings. Management efficiency increases in large forage areas because livestock control and access is easier and less costly.

Protection of Archaeological Resources

There should be no significant differences among the silvicultural systems in their risk of damage to undetected archaeological resources. Damage depends more on the intensity and frequency of management treatments than on the kind of silvicultural system, particularly when large machines are used.

Effects on Fisheries and Wildlife Habitat

Fisheries habitat is most easily protected where the water quality is high, stream temperatures are kept moderate through shading, and where the runoff quantity is sufficient to maintain spawning areas. The single-tree selection or group selection systems are usually more advantageous than the even-aged systems for managing the vegetation in riparian management zones. However, the silvicultural systems used outside these zones do influence the amount of sediment in the water (see the discussion in the section titled **Risks of Adverse Effects on Watersheds and Soils**.)

The choice of silvicultural systems to best manage wildlife habitat depends on which species are to be emphasized. Regardless of which treatment is used in a stand, some species will benefit and others will not. Most wildlife species are adapted to thrive in specific structures and species of forest vegetation. For example, the use of the even-aged or group selection systems favors deer, quail, and rabbits that use herbaceous and shrubby vegetation most abundant in large openings in the forest. The single-tree selection system may favor animals that need vertical diversity, such as spotted owls and tree squirrels.

Almost all forest wildlife species could use a particular young-growth stand at some time in its development regardless of the silvicultural system. (The exceptions are the few species that may be totally dependent on very large, decadent trees for habitat.) The kind of silvicultural system used would influence the proportions of wildlife species and when and how they could use the stand as habitat. A significant exception is single-tree selection management applied to large areas. The absence of large openings could prevent use by wildlife adapted to this kind of habitat, such as soaring hawks. Overall, a mix of the silvicultural systems would probably best meet most wildlife management objectives.

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Table J-1
Ratings of the Major Silvicultural Systems by Principal Biological Attributes


is Good, Excellent, or many


is Good to Moderate


is Moderate or Few


is Poor or None

BIOLOGICAL ATTRIBUTES	CLEAR-CUTTING	SHELTER-WOOD	SEED-TREE	GROUP SELEC-TION	SINGLE-TREE SELEC-TION
Appearance					
a. Diversity of tree sizes in a stand:					
(1) Vertical					
(2) Horizontal					
b. Number of openings in a forest[1]:					
(1) Larger than 2 acres					
(2) 1/10th to 2 acres					
(3) Smaller than 1/10th acre					
c. Potential for conserving or improving plant species diversity in a stand.					 [2]
Genetics					
a. Resistance to inbreeding effects;					
b. Resistance to degradation by "high-grading";					
c. Potential for conserving genes in a forest[3].					
Productivity (potential for producing biomass)					

1. Exclusive of roads and natural openings such as meadows or rock outcrops.

2. Assumes no major fires; otherwise "Poor."

3. Assumes all harvested species are planted successfully, or will regenerate naturally; otherwise "Poor."

Table J-2
Ratings of the Major Silvicultural Systems by Key Managerial Attributes


is Good, Excellent, or many


is Moderate or Few


is Poor or None

MANAGERIAL ATTRIBUTES	CLEAR-CUTTING	SHELTER-WOOD	SEED-TREE	GROUP SELEC-TION	SINGLE-TREE SELEC-TION
Overall Public Acceptance					
Natural Appearance					
Soil Protection in Stands					
Soil stability where soils have high erosion potentials.					
Scientific Knowledge Base and Management Experience					
Wood Production					
a. Cost efficiency of treatments:					
(1) General (based on treatment unit size)					
(2) Regeneration					
(3) Feasibility of aerial application of herbicides					
(4) Harvesting					
b. Potential for regulating the forest, while maintaining harvest levels.					
c. Administrative efficiency (planning, contracting, and record keeping).					
d. Need for control of competing vegetation.					
e. Potential for retaining vigor and value of residual trees[1].					
f. Potential for genetic improvement of trees by planting.					
Controlling Wildfires in a Forest					
a. Potential for controlling major wildfires.				 [2]	 [3]
b. Potential for using controlled fires to manage fuels.				 [2]	 [3]
Risk of Significant Pest Damage					
Potential for controlling damage from dwarf mistletoes and certain tree root deseases.				 [2]	
Livestock Production Potential in a Forest				 [2]	

Table J-2 (continued)
Ratings of the Major Silvicultural Systems by Key Managerial Attributes

■ is Good, Excellent, or many
▨ is Moderate or Few
□ is Poor or None

MANAGERIAL ATTRIBUTES	CLEAR-CUTTING	SHELTER-WOOD	SEED-TREE	GROUP SELEC-TION	SINGLE-TREE SELEC-TION
Streamside Management Zones					
Potential for protecting fish habitat	□	▨	□	▨	■
Wildlife Habitat in a Forest					
a. Potential for deer, rabbits, and quail	■	■	■	■	□[3]
b. Potential for spotted owls and tree squirrels	▨	▨	▨	■	■
c. Potential for soaring hawks and eagles.	■	■	■	▨[2]	□[3]

[1] Assumes gentle slopes; otherwise "Moderate", but "Poor" for the Group and Single-tree selection systems.

[2] Assumes openings of about 1-2 acres; "Poor" if smaller.

[3] Assumes highly productive land; otherwise "Moderate" or "Good".

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